Riparian Classification for the Upper Salmon/Middle Fork Salmon River Drainages, Idaho

Final Report

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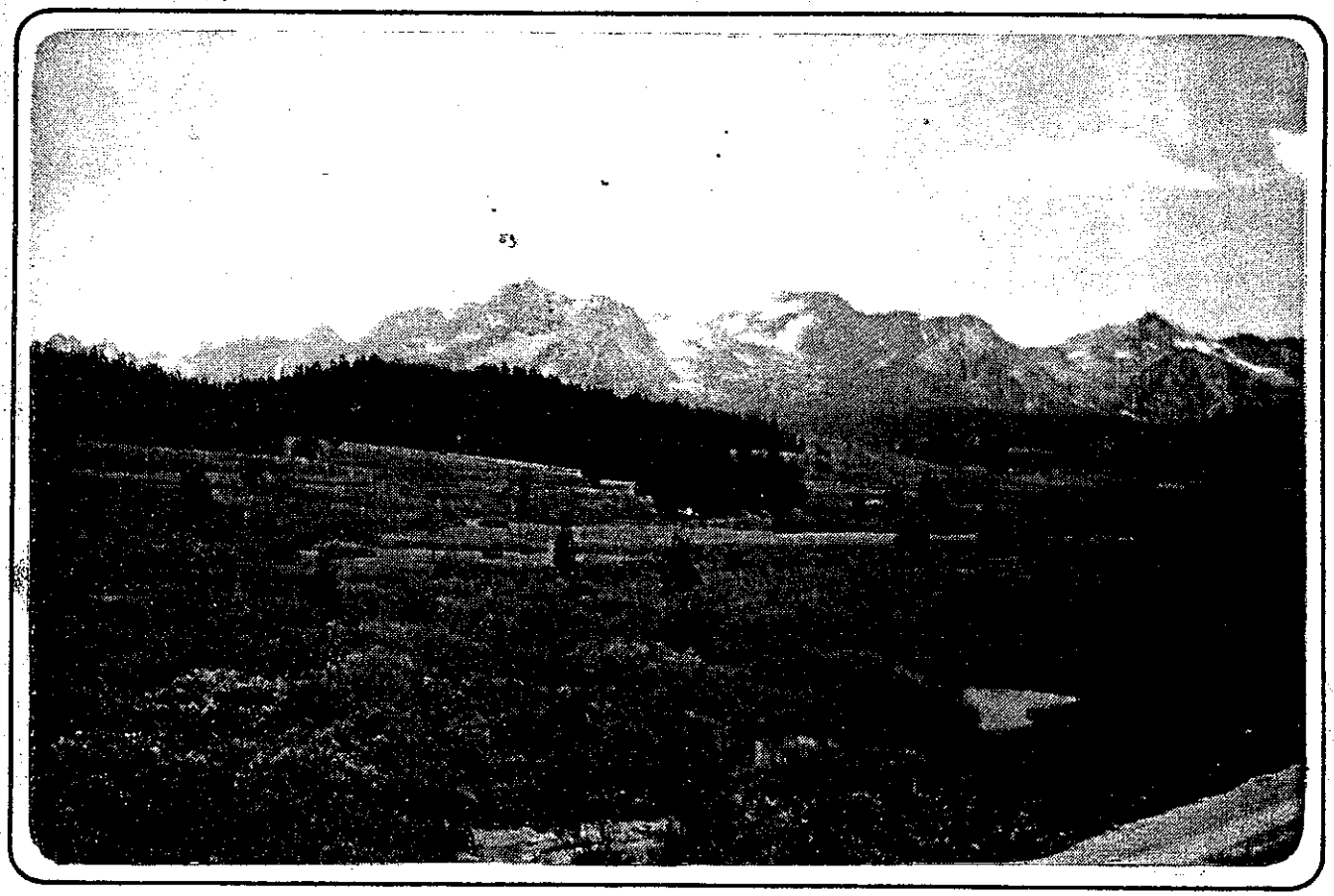

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ABSTRACT

A community classification was developed for riparian zones of the upper Salmon and Middle-Fork Salmon River drainages, Idaho. The classificaton is based primarily on floristic composition. Environmental, soil and hydrologic characteristics were also considered. Field observations were centered within 178 plots, each five by ten meters. Plots were subjectively chosen to include the range of vegetation types for the study area. Vegetation parameters include a complete species list, estimates of canopy coverage for each species and descriptions of community physiognomy. Environmental parameters recorded for communities include: slope, aspect, width of valley-bottom, position in valley-bottom, types of adjacent communities and nature of boundaries, microtopography and shape, and sources and degree of disturbance. A soil profile was described to a depth generally just below that of the ground-water level (gwl) for each plot. Hydrologic parameters described include depth to gwl and depth to the top of the capillary fringe.

Sample plots were initially grouped into tentative taxonomic units based on floristics. Tentative groupings were modified and/or verified from results of floristic cluster analysis; community types were subsequently defined. Soils were classified to the family level and interpreted for erosional and water handling characteristics. Soil, environmental and hydrologic parameters of community types were tabulated and treated by Analysis of Variance and clustering procedures. Inherent processes and states of community systems were deduced from data analysis.

Ecological concepts were developed from the merger of floristic and soil/hydrological/environmental concepts. Successional inferences were developed from observation of spatial relationships among communities, and from extrapolation and interpretation of processes and states inherent to systems. Management directives were derived from interpretation of soil and hydrologic parameters.

CHAPTER I
INTRODUCTION

This report presents a riparian classification for the upper portions of the Salmon and Middle Fork Salmon River watersheds in central Idaho. The report was developed under terms of a contract between the USDA Forest Service, Region IV, and White Horse Associates of Smithfield, Utah.

Riparian Definitions

Dictionaries define "riparian" as an adjective pertaining to the bank of a stream, river, or lake: the term describes geographic position. In much of the western United States, "riparian" is used synonomously with "wetland", since most wetland is adjacent to streams, rivers or lakes. Such regional use of the word has caused confusion elsewhere, especially the eastern United States, where wetlands are not restricted to streambanks or lakeshores. Additional misunderstanding results where land adjacent to streams or lakes is not wetland. This report uses the term "riparian" in the context of wetlands associated with flowing surface or subsurface water and ponded water in valley bottoms.

Riparian zones are considered transitional areas between aquatic and upland (terrestrial) habitats (Odum, 1978). Riparian habitats may be defined more specifically by their vegetation and soil characteristics.

Vegetation

Riparian vegetation cannot exist without the moisture supplied by surface or ground water (Campbell, 1970). Riparian communities require an "internal" water supply, additional to that of precipitation. Riparian communities are predominantly comprised of species which cannot grow on adjacent upland habitats.

Soil

Riparian soils are those with characteristics indicative of a ground water table: distinct or prominent mottles, matrix colors indicative of a reducing soil-moisture regime, complete removal of carbonates or concentrations which decrease with increasing depth; and saturated conditions for a significant duration when soil temperatures are above biologic zero ($>5^{o}C$). These characteristics are observable within one meter of the soil surface. The definition was found to exclude sites with non-riparian vegetation contiguous to inclusive riparian sites.

Need for Classification

Klemmedson et al. (1978) list five categories of rangeland research, of which two "need immediate attention". These are studies of community and species dynamics, and a regionally accepted system for classification, identification and inventory of range ecosystems. This report deals with community dynamics in the form of successional inferences and potential reactions to disturbance. It is consistent with Norton et al. (1981) as a second stage in a regional riparian classification which is analogous to existing forest, shrubland, and grassland classifications.

Patton (1977) writes that classification is among several categories of riparian research necessary to provide resource managers with sound information for decision-making. Pase and Layser (1977) note that classification aids communication about riparian zones and assists the inventory of such habitats; it also helps to predict succession and results of land use practices, and serves as a framework for additional research.

Related Work

The current interest in riparian areas among management agencies has resulted in a growing number of recently completed and ongoing classification efforts. Among the most recent are Jensen and Tuhy (1981) in northeastern Utah, Padgett (1981) in eastern Oregon, Tuhy (1981) in central Idaho, Norton et al. (1981) in western Wyoming, and Mattson (in progress) in Yellowstone National Park. These studies have concentrated primarily on smaller rivers and/or their tributary streams, as did Hansen (1977) on the south slope of the Uinta Mountains in Utah, and Miller (1976) along small tributaries of the Snake and Salmon River canyons in Idaho.

Larger rivers and their floodplains have also received attention. Such studies dealing partly or wholly with classification include Allen (1980) in northwestern Montana, Irvine (1976) in southern Utah, Huschle (1975) along the middle and lower Snake River, and Fonda (1974) in western Washington.

Other community or habitat type classifications in the west (Hall, 1973; Volland, 1976; Pfister et al., 1977; Henderson et al., 1976, 1977; Mueggler and Stewart, 1978; Steele et al., 1979a, b) include some riparian types, though they generally emphasized upland communities.

Plant Ecology Concepts

Riparian zones in the western United States are generally associated with drainage courses and thus are usually elongate in shape. Though small in aggregate area, such corridors are important islands of diversity in regional ecosystems. Communities within riparian zones are often arranged in complex mosaics associated with soil and hydrologic variation. Greater water supply contributes to a generally larger annual biomass productivity in riparian zones compared to adjacent uplands.

Plant Communities

Plant communities are the units with which this classification is constructed. A plant community is an aggregation of plant species populations. It is visible in the field and can be described both quantitatively and qualitatively (Poore, 1955a).

Gleason (1939) defines four essential criteria for a plant community: homogeneity, definite size or area, boundaries, and duration in time. He also argues that vegetation, regardless of successional status, varies continuously in time and space. Discrete community boundaries in the field correspond to abrupt changes in environmental parameters.

Disturbance, Succession and Climax

Riparian zones are geomorphically active, with frequent natural disturbances affecting pedogenic and hydrologic parameters. Concurrent successional change in plant communities is mostly primary rather than secondary (Mueller-Dombois and Ellenberg, 1974). Change due to external factors was termed "allogenic succession" by Tansley (1929). Autogenic succession, change due to actions of plants on the habitat, also occurs in riparian zones. Vegetation change may be successive (forward) toward greater diversity and higher life forms, or retrogressive (backward) toward lesser diversity and lower life forms.

The climax concept connotes long-term dynamic stability in a plant community. The applicability of climax in the riparian zone varies depending on interpretation and terminology. Four specific interpretations are discussed below.

Lowe (1964) believes that "it is incorrect to regard this biotic formation [zone of riparian vegetation] as merely a temporary unstable, seral community. It is an evolutionary entity with an enduring stability equivalent to that of the landscape drainageways which form its physical habitat. That is, it is a distinctive climax biotic community."

Lowe's "climax biotic community" is not a climatic climax in the sense of Clements, (1916), because riparian vegetation requires moisture in addition to precipitation. In this monoclimax scheme, a riparian zone

may represent a "fluventic" disclimax. A disclimax is a quasi-permanent community with the general character of climax, which replaces the true climax as a consequence of continuous modification or disturbance (Clements, 1936).

Alternatively, in the polyclimax scheme of Tansley (1935), the same riparian zone may be termed an edaphic (or hydrologic) climax, rather than a disclimax. The difference is mostly one of terminology (Cain, 1939).

Campbell and Green (1968) write that riparian vegetation "probably never reaches a climax hierarchy" because of "large scale changes in habitats caused by recurring floods, erosion, and deposition." Lowe (1964) regards the riparian zone as an entity with enduring stability, whereas Campbell and Green (1968) believe that recurring disturbance does not allow a potentially stable climax community to develop.

The climax concept varies depending on the meaning of stability. If stability means that the plants of a community are capable of reproducing themselves onsite, then many riparian communities are stable. Such communities often exhibit strong association with soil and environmental properties, and could be considered edaphic climaxes.

This report recognizes stability in terms of relatively constant species composition and structure (Mueller-Dombois and Ellenberg, 1974) over long time frames. In this case, many riparian communities are unstable since fluvial disturbances which interrupt community development generally recur at shorter time intervals. Thus, a riparian "climax" community may be physiognomically different from earlier seral stages. Such a climax state is seldom reached and has little meaning for management purposes, though some riparian forest communities approximate this definition of climax.

Many riparian communities are in early stages of primary succession with rapidly-changing seral progress. In contrast, upland communities represent late stages on primary successional paths where succession proceeds too slowly to be readily percieved. Cowles (1899,1901) and Olson (1958) support the idea of early/rapid and late/slow primary successional change. Climax in upland communities may be defined as the endpoint of secondary succession, which coincides with the long-term stable stage of primary succession.

Classification Concepts

Community Types (cts)

A community type is an aggregation of homogeneous plant communities which have nearly the same species composition. Community type is an abstract concept (Nichols, 1917; 1923). A type is comprised of communities which are qualitatively but not quantitatively similar (Poore, 1955a). The community type concept is applicable regardless of community succes-

sional status (Carpenter, 1936).

Community types are classified on the basis of indicator species. All strata are noted to reflect the structure of the entire community rather than focusing on individual layers. Indicator species are often dominant, with high constancy and relatively high fidelity. Because indicators are not always dominant and because all pertinent strata are involved, these units are not dominance types.

Habitat Types (hts)

Some riparian forest sites in the study area represent the climax vegetation stages upon which the habitat type concept is based. A habitat type encompasses all the land capable of producing similar long-term stable plant communities. Habitat type concepts are discussed by Daubenmire and Daubenmire (1968) and Pfister and Arno (1980).

Many riparian community types correlate with soil and environmental properties, and are thus more than mere phytosociological units. These units may represent a "type of habitat", yet are not "habitat types" because this latter term is applied only to long-term stability or climax.

Limits and Variability of Classification Units

Divergence of opinion over what constitutes a "type" stems from the varying degree to which investigators recognize differences between the constituent plant communities, rather than broad similarities (Cain, 1939). Poore (1956) writes that classification into community type or habitat type units frequently depends on making arbitrary divisions where no clear divisions exist. He further states that such units represent nodes or clusters of concrete communities, and that the nodes do not all have the same degree of internal variability. Some nodes are cohesive, highly-integrated groups of communities, identifiable by exclusive dominants. Other nodes are diffuse, loosely-integrated collections of species owing their presence to certain habitats.

Poore (1956) observes that connections between the community types of a region form a multidimensional net of variation. This will be apparent to those who seriously use this riparian classification.

Validity and Cautions

Research or management of riparian zones requires logical classification uints with which to work. Community types, composed of recurring communities that are nearly alike, are valid units within a relatively small region. Not every community will fit neatly into a type, as some plots are transitional between types.

Those using the community type approach may encounter problems over a large region. Gleason (1939) states that there is not exact repetition of

vegetation from one community to the next and that there is no genetic or dynamic connection between constituent communities of a type. Furthermore, "variations of a cumulative nature ... increasing in importance and conspicuousness as more-distant communities are considered, finally lead to vegetation of such unlike nature that they would never be classed in the same association-type [community type]." The investigators observed that this classification seems to work in regions of similar elevation and/or climate in the Central Rockies/Intermountain zone, but care must be observed where environmental parameters deviate significantly.

Environmental Concepts

Floodplain Genesis

The genesis of fluvial valley bottoms is determined to a great extent by hydraulic gradients. The "energy signature" of stream systems, as proposed by Kangas (1978), is a "power line" concentrated as a force moving parallel to the surface over a long, narrow area. The energy potential of such a system is the difference in elevation between two points of concern.

The longitudinal slope of a stream decreases as an inverse function of discharge (Bloom, 1978). In valley systems, discharge generally increases in a downstream direction as a result of the intersection of lower order tributaries and subsurface seepage. Thus, the slope of the water surface decreases in a downstream direction.

The competence of a fluvial system increases exponentially as a function of discharge (the volume of water moving past a point per unit time). A tenfold increase in discharge may increase the sediment load a hundredfold to a thousandfold.

Streams move most of the total annual sediment load during short intervals of maximum discharge resulting from periods of rapid snowmelt and/or intensive rainfall. Sediment is delivered to streams by mass wasting and rill wash of upstream watersheds and erosion of stream channels.

The deposition of sediments comprising the floodplain is of two general modes:

1. Vertical accretion occurs when discharge becomes greater than channel capacity and bank overflow occurs. The shallow, low-velocity sheet of floodwater has little competence relative to channel flow. Sediments are deposited on the floodplain and are sorted from coarse to fine in a direction away from the channel axis.

2. Lateral accretion is a redistribution of sediments deposited by vertical accretion. As a stream meanders across its floodplain, channel banks are undercut and eroded. The process is emphasized

at convex point-bars where banks are most susceptable to erosion due to near-perpendicular position relative to the force of stream-flow. As a bank is undercut and collapses, sediment is carried downstream and redeposited. Lateral accretion is a principal process of channel modification and lateral movement across the floodplain.

Flow characteristics of fluvial systems in western montane areas are often modified by the engineering habits of beaver. Flow velocity, competence, sediment load capacity and channel geometry are affected. Beaver channels may extend the aquatic environment to distal areas of the valley bottom relative to the stream channel position. The still or slowly circulating water of beaver ponds and channels favors proliferation of aquatic vegetation during periods of low discharge and deposition of relatively fine-grained sediments during high-water periods and flooding events.

Other factors affecting the hydraulic gradients of fluvial systems and the consequent genesis of floodplains are mass wasting of contiguous valley slopes, debris jams and the engineering practices of man.

An idealized fluvial system is one in which energy gradients, increasing in a downstream direction and decreasing in a direction perpendicular to the channel axis, result in sorting of alluvial material from coarse to fine in a direction of decreasing energy.

Ecosystem Processes and States

The morphology and genesis of soil are products of ecosystem processes upon environmental states. A process represents an energy flux into or through an open system. In this case, the system is a very thin, unconsolidated surface mantle upon which most terrestial plant and animal life is dependent.

Processes affecting the soil system include:

1. Transport and deposition.
2. Eluviation and Illuviation.
3. Organic matter production and mineralization.
4. Physical weathering and sedimentation.
5. Chemical weathering and recombination.
6. Flocculation and dispersion of ped structure.

In recent times, man has played an increasing role in orchestrating the rate and direction of ecosystem processes.

The state of the system (or more precisely the free energy of the system) is defined by its composition, position, temperature and pressure. In systems with relatively consistent temperatures and pressures in time and space, a description of state reduces to that of composition and position.

A generalized composition of the soil system includes:

1. Weathered, unconsolidated mineral material.
2. Organic products and residues.
3. Consolidated mineral material (rocks).
4. Water.

Water is conventionally considered a separate system integral with the soil system. For ease in this discussion, water is considered as part of the soil system. The composition of the soil system affects and is mutually affected by system processes.

The position within a system is important where processes originate from point or line sources (transport and deposition) and where the composition of the system is not homogeneous (such as is most common in natural systems).

A history of processes in riparian systems is well-documented in the morphology of soil profiles. States of the system are more ephemeral in nature. Soil morphology is a description only of the present state of the system, although past states may often be inferred from evidence of concurrent processes.

Soil Morphology

Soils of riparian zones exhibit a much wider range and degree of diversity than soils of adjacent uplands. Soil textural classes, organic matter (OM) content and distribution may vary significantly between sites of a given area. Taxonomic soil units are arranged as complex associations of polypedons, each with distinct properties and characteristics. The spatial boundaries of polypedons correlate with very subtle changes in microtopography and hydraulic geometry.

Soil textural classes range from fragmental material to deep organic deposits. A high degree of textural diversity was noted, both among contiguous sites and within the profile of distinct pedons. Textural classes of surface horizons generally grade from coarse to fine away from the channel axis. Subsurface textural classes are somewhat less characterized by this generalization, presumably due to lateral accretion and channel

displacement across the floodplain. In situ weathering may alter soil textures over long periods of time under conditions favorable to weathering and pedogenic processes.

The OM content of riparian soils varies from near one hundred percent in deep organic deposits to less than one percent in recent fluvial deposits. The depth distribution of OM in mineral soil profiles is often irregular in contrast to the regular decrease with depth in soils of upland units. This distribution is indicative of the rate of fluventic deposition relative to OM production.

Organic matter (OM) decomposition is a biologically induced process greatly affected by soil-water content. OM decomposition proceeds at a very slow rate under anaerobic conditions, more rapidly under moist aerobic conditions and very rapidly under fluctuating moisture status. The degree of OM decomposition of surface and subsurface organic horizons is indicative of temporal variation or consistency of the soil moisture status.

The presence or absence of gaseous or dissolved oxygen in soil systems also affects the rate of biologically induced nutrient cycling and oxidation-reduction reactions. The taxonomic classification of riparian soils is based, to some extent, upon the presence of absence of spots of contrasting colors (mottles) resulting from the segregation of iron and magnesium from soil mineral components. Mottles of high chroma (bright colors) indicate alternating oxidation-reduction processes, while mottles of low chroma (grey colors) are indicative of prolonged reducing conditions.

Some fine-textured subsurface horizons permanently saturated with ground water are of low chroma throughout the matrix, and are hues of blue to green (gleyed horizons). Gleyed soil materials often change color when exposed to the atmosphere.

The morphology of riparian soils reflects both the processes of sediment deposition and of in-situ pedogenesis. Pedons characterized by vertical accretion generally occupy an intermediary position between the channel axis and upland units. Morphologic characteristics indicative of vertical accretion are:

1. Distinct horizons of contrasting textural clases within soil profiles.

2. An OM content of mineral horizons which decreases irregularly with depth.

3. Subsurface organic horizons.

Pedons characterized by lateral accretion are generally contiguous to the channel axis, but may extend to the periphery of the valley bottom where stream channel position has been displaced over time. Morphologic characteristics indicative of lateral accretion are:

1. Relatively thick horizons which often contain rounded rock fragments.

2. Low OM content in mineral horizons which either decreases regularly with depth in the profile or is homogeneous throughout the profile.

3. No subsurface organic horizons or "A" horizons within the depth range affected by lateral accretion.

In-situ pedogenesis requires some degree of temporal stability. In time, in-situ development may mask those characteristics inherent to vertical and lateral accretion. In-situ development is characterized by:

1. Textural horizons which generally become coarser with depth in the profile.

2. An accumulation of mineralized OM in surface mineral horizons which decreases regularly with depth in the soil profile.

Although in-situ development is observable to some degree in most sites, it best characterizes sites above the maximum water level of depositional events. These sites are often contiguous to upland units or may occur where vertical accretion has built up surface levels above the normal flood water level. The rate of in-situ pedogenesis is greatly affected by soil moisture status.

Soil Taxonomy

The taxonomy of soils is based on soil morphology, an expression of ecosystem processes and the current state of the system. Soils were classified as Entisols, Inceptisols, Mollisols, Alfisols and Histosols at the Order level. Brief criteria for taxa to the Subgroup level are presented in Table 1. Taxa to the subgroup level are now discussed with respect to each soil Order.

Entisols. These are young soils indicating little or no in-situ development. The absence of pedogenic horizons may be a result of insufficient time, an anaerobic environment which restricts chemically and biologically triggered oxidation reactions, or active erosion and deposition proceeding at a rate equal to or greater than that of pedogenic processes.

Table 1. Distinguishing soil taxonomic criteria to the subgroup level.

Classification	Taxonomic Criteria
Order	Order
Suborder	Suborder
Great Group	Great Group
Subgroup	Subgroup
Entisols	No pedogenic horizons
Aquents	Saturated to surface
Cryaquents	Cool temperature regime
Typic	None
Fluvents	Deposited by periodic flooding
Cryofluvents	Cool temperature regime
Typic	None
Mollic	Epipedon of OM accumulation
Aquic	Saturated within 50 cm
Orthents	Other Entisols
Cryorthents	Cool temperature regime
Aquic	Saturated within 50 cm
Typic	None
Inceptisols	Altered subsurface horizon
Ochrept	Ochric epipedon (low OM)
Cryochrept	Cool temperature regime
Typic	None
Mollisols	Mollic epipedon (ep)
Aquolls	Saturated to surface at some time
Cryaquolls	Cool Temperature regime
Typic	gwls above 1 m (> 90 days)
Histic	Histic ep over Mollic ep
Cumulic	Epipedon > 40 cm thick

Table 1. (continued)

Classification	Taxonomic Criteria
Order	Order
Suborder	Suborder
Great Group	Great Group
Subgroup	Subgroup
Borolls	Cool temperature regime
Cryoborolls	Cool temperature regime
Aquic	gwls above 1m (> 90 days)
Argic	Illuvial clay accumulation
Argiaquic	Illuvial clay and Aquic
Cumulic	ep > 50 cm thick (fluvial)
Pachic	ep > 50 cm thick (colluvial)
Typic	None
Alfisols	Forest soils
Boralf	Cool temperature regime
Cryoboralf	Cool temperature regime
Mollic	Mineralized OM accumulation
Aquic	Saturated above 1 m
Histosols	Organic soils
Fibrists	Least mineralized OM
Borofibrists	Cool temperature regime
Terric	Mineral horizon present
Hemists	Moderately mineralized OM
Borohemists	Cool temperature regime
Terric	Mineral horizon present
Fluvaquentic	Fluvial deposition
Saprists	Most mineralized OM
Borosaprists	Cool temperature regime
Terric	Mineral horizon present
Fluvaquentic	Fluvial horizons
Typic	No mineral horizons

At the Suborder level, Entisols were classified as Aquents, Fluvents and Orthents. Aquents are saturated to the soil surface for most of the growing season. Fluvents are soils with characteristics other than those of Aquents, and in which the organic carbon content decreases irregularly with depth. Fluvents include those soils with distinctly segregated horizons indicative of fluvial deposition. Orthents have characteristics other than those described for Aquents and Fluvents. These soils occur primarily on recent erosional surfaces other than floodplains. They are not saturated in surface horizons for significant periods of time.

At the Great Group level, Entisols are Cryaquents, Cryofluvents and Cryorthents. The mean annual soil temperature at 50 cm below the surface is greater than $0^{o}C$; mean summer temperatures are less than $15^{o}C$, as defined for the cryic temperature regime. At the Subgroup level all Cryaquents are Typic. The Subgroup exhibits a wide range of wet and cold soil characteristics. Some Typic Cryaquents have an organic horizon at the surface or buried beneath a layer of mineral material. An anaerobic environment and cool temperatures limit the rate of OM decomposition. Organic horizons are composed primarily of relatively undecomposed soil material.

Three Subgroups of Cryofluvents were distinguished: Typic, Aquic and Mollic. Typic Cryofluvents are not saturated above 50 cm from the surface for significant periods of the growing season and do not have a surface horizon appreciably darkened by OM to an extent approaching that definitive of a mollic epipedon.

Aquic Cryofluvents deviate from the Typic concept in being saturated within 50 cm of the surface for significant periods of most growing seasons. This is evidenced by mottles of low chroma in surface horizons which may be darkened by OM to the extent defined for Mollic epipedons, but are not thick enough to be classified as Mollisols. Aquic Cryofluvents are intergrades to Aquents.

Mollic Cryofluvents are not saturated within 50 cm of the surface for significant periods and have a surface horizon appreciably darkened by OM, but the epipedon is not thick enough to be definitice of a Mollisol.

Inceptisols. A single taxon of Inceptisols was described as a Typic Cryochrept. This taxon has an epipedon with relatively low OM content (Ochric epipedon), a subsurface horizon altered by pedogenic processes (Cambic horizon), a cool temperature regime and is not continuously saturated in any horizon above 75 cm. These soils generally occur in areas adjacent to or within upland communities.

Mollisols. These soils have a surface horizon appreciably darkened by mineralized OM to the extent defined for a Mollic epipedon. Subsequent classification of Mollisols is delineated from soil moisture regime,

thickness of the Mollic epipedon, presence or absence of Histic epipedons, and presence of illuvial horizons of clay accumulation (argillic horizons).

At the Suborder level, Mollisols saturated to the surface for significant periods of the growing season are Aquolls. Characteristics associated with wetness include distinct mottles at or near the base of the epipedon, matrix colors of low chroma indicative of a prolonged reducing environment below the epipedon; and groundwater present at such a shallow depth that the capillary fringe reaches the soil surface (except in non-capillary pores). Since the genesis of Mollic epipedons requires aerobic conditions favorable to OM mineralization, the period of time the soil is saturated may be somewhat less than that of Aquents. The authors' concept of Aquolls is characterized by a fluctuating gwl, although the taxonomy is not explicit on this point.

Mollisols not saturated to the surface for significant periods are classified as Borolls at the Suborder level. These Mollisols are characterized by a cold (cryic) temperature regime.

At the Great Group level, Mollisols are Cryaquolls, and Cryoborolls. Soil temperatures are definitive of a cryic temperature regime.

Three Subgroups of Cryaquolls were distinguished: Cumulic, Histic, and Typic. Those Cryaquolls with a Mollic epipedon less than 40 cm thick and without an organic surface horizon definitive of a Histic epipedon are Typic Cryaquolls. Cumulic Cryaquolls have a Mollic epipedon greater than 40 cm thick, resulting from long-term concurrent OM production, mineralization, and redistribution in the profile; or by a rate of sedimentation approximately equal to that of OM production and mineralization. Histic Cryaquolls have a Histic epipedon and are intergrades to Histosols. These are the wettest Mollisols and are saturated for most of the growing season.

Cryoborolls are classified as Aquic, Argic, Argiaquic, Cumulic, Pachic or Typic at the Subgroup level. Aquic Cryoborolls are saturated in some horizon above one meter for greater than two consecutive days and do not have an overthickened epidon. Cryoborolls with a horizon of illuvial clay accumulation (argillic horizon) are Argic at the Subgroup level. Argiaquic Cryoborolls are those with characteristics of both Aquic and Argic Subgroups.

Cumulic Cryoborolls have an overthickened epipedon (>40 cm thick) resulting from repeated fluvial deposition. Those soils with an overthickened epipedon derived from colluvial deposition are Pachic Cryoborolls. Typic Cryoborolls are those without the distinguishing characteristics of other Subgroup taxa.

Alfisols. The central concept of Alfisols is that of an Ochric epipedon not darkened by mineralized OM to the extent of a Mollic epipedon, and a horizon of illuvial clay accumulation (argillic horizon). At the Great Group level, these Alfisols are Cryoboralfs as indicative of cryic (cold) soil temperatures.

Two Subgroups of Cryoboralfs were identified: Aquic and Mollic. Soils with an epipedon approaching that definitive of a Mollic epipedon are Mollic Cryoboralfs. Aquic Cryoboralfs may have characteristics definitive of the Mollic Subgroup and are saturated within one meter of the surface for most of the growing season. Alfisols generally typify sites transitional to forest habitats.

Histosols. Generally, Histosols are soils in which at least half of the surface 80 cm is greater than 50 percent OM. The cumulative thickness criterion may be modified when organic material rests on rock or fragmental material. Subsequent taxa are determined by degree of OM decomposition, soil temperature regime and presence of mineral horizons. At the Suborder level, soils are Fibrists, Hemists and Saprists.

Fibrists are organic soils in which the botanic origin of the dominant OM is recognizable. These are the least decomposed of organic soils identified and are generally permanently saturated in fibric horizons.

The dominant OM is intermediately decomposed in Hemists. OM is of high fiber content, but generally not recognizable as to botanic origin. Hemic horizons are generally saturated most of the time when temperatures are greater than biologic zero.

Saprists are organic soils in which the dominant OM is almost completely decomposed. The fiber content of OM is low and not recognizable as to botanic origin. A fluctuating soil-moisture regime of flowing groundwater, containing sufficient dissolved oxygen for biologic oxidation processes, characterizes Sapric horizons.

At the Great Group level, identified Histosols are Borofibrists, Borohemists and Borosaprists on the basis of soil temperature regime. At the Subgoup level, Histosols are Terric, Fluvaquentic and Typic. Terric taxa have a mineral horizon 30 cm or more thick within 130 cm of the surface. Fluvaquentic subgroups have two or more thin (<30 cm) mineral horizons within 130 cm of the surface. This taxon is indicative of periodic fluventic deposition interspersed with periods of OM proliferation. Typic Subgroups do not have mineral horizons thicker than 5 cm within 130 cm of the surface.

Histosols occur where OM proliferation dominates over mineralization and erosional processes. Systems are associated with subsurface flowing groundwater on toeslopes and with still groundwater in concave positions throughout the valley bottoms.

Family Differentiae of Mineral Soils. Differentiae of the family levels of mineral soils are: Particle-size class; mineralogy class; and soil temperature class.

Particle-size classes range from fragmental to fine, although most polypedons are coarse-loamy and fine-loamy.

All soils examined are of mixed mineralogy class. Most are non-calcareous although soils of Slate Creek and Warm Springs Meadows are calcareous. Parent materials are predominantly of granitic origin.

All polypedons are of the frigid soil-temperature class. Since the frigid family modifier is implied in all Boric Suborders and Cryic Great Groups, repetition as a family modifier is redundant and is omitted.

Family Differentiae of Organic Soils. The particle-size classes of Terric Subgroups of Histosols range from fragmental to fine. The mineralogy class is mixed as for mineral soils. The pH of organic horizons are all above 4.5, as definitive of the euic reaction class. Soil temperature classes are stated at the Great Group level.

Management of Riparian Ecosystems

Federal land-management agencies are concerned with development of management criteria for riparian zones. Concern is directed to developing practices facilitating multiple land uses while preserving qualities of wildlife habitat and the integrity of watersheds. A principal concern in the Salmon/Middle Fork study area is the preservation and/or improvement of anadromous fish habitat.

Livestock normally concentrate in riparian zones due to the presence of succulent forage, shade and water (Berry, 1979). Berry delineates three parameters used to evaluate fish habitat:

1. Stream surface shade;
2. Stream bank stability;
3. Streambed sedimentation.

Parameters are a reflection of the quality of riparian systems adjacent to streams.

Ptankuch (1975) developed methods of rating the conditions of stream channels and banks. Ratings are a quantification of parameters listed

above and are aimed at determining potential effects upon fish habitat in aquatic systems.

May and Somes (1979) report on the comparative effects of sheep and cattle grazing in Marsh Creek drainage (within the study area). The study focuses on streambank condition resulting from each of the two ungulates and potential effects upon fisheries. Their conclusion is that sheep are less detrimental than cattle. It is somewhat unclear whether or not the result is a consequence of sheep preference for upland habitats.

Platts (1978, 1979, 1981) reviews the effects of livestock grazing on Riparian/Stream ecosystems, again with particular emphasis on the effects upon fisheries. Most studies have been concerned with evaluation of streambank conditions and resultant impacts upon fisheries. Few references to studies incorporating the range of valley bottom riparian communities were noted.

In accordance with the principal conflicts noted in and around the study area, methods of this investigation are directed toward contributing to an understanding of riparian systems extending from streamside to the edge of valley uplands. From this understanding a broader perspective of management potentials for riparian and aquatic ecosystems may develop.

CHAPTER II
OBJECTIVES

This project is a field-oriented study to develop concepts and a classification for riparian habitats on portions of the Sawtooth, Challis and Boise National Forests. Specific objectives of this study are to:

1. Develop a comprehensive community type classification for the riparian ecosystem of the upper Salmon and Middle Fork Salmon Rivers, Idaho.

2. Determine vegetation-soil-environment relationships for each community type.

3. Determine relationships of the community types to each other spatially, geographically and, where data allow, successionally.

4. Determine the relationship of community types identified in the study area to other riparian types known from central Idaho and/or elsewhere in the west.

5. Suggest some implications for management of these community types.

6. Reconnoiter upper tributaries and lower reaches of the adjacent South Fork Salmon River watershed to determine future sampling needs for an expansion of this classification.

CHAPTER III
THE STUDY AREA

Location

The study area lies in portions of the Challis, Sawtooth and Boise National Forests in Custer, Blaine and Valley Counties, Idaho (Figure 1). It encompasses the watershed of the Salmon River from the Forest Service boundary above Clayton to the headwaters below Galena Summit. Also included is the watershed of the Middle Fork Salmon River above Dagger Falls, primarily the Marsh and Bear Valley Creek drainages. Valley bottom elevations range from 1700 m (5580 ft) at the lower Salmon boundary and 1730 m (5680 ft) at Dagger Falls, to basins as high as 2870 m (>9400 ft) in the White Cloud and Sawtooth Mountains.

Physiography

The study area lies within the Northern Rocky Mountain Physiographic Province (Arnold, 1975). The easternmost portion is in the Challis Section of this province and the remaining area is in the Southern Batholith Section.

The lower reaches of the Salmon and Middle Fork Salmon Rivers flow through narrow, steep-sided canyons. Farther upstream the bottoms broaden into montane valleys several kilometers wide, exemplified by the Sawtooth Valley, Stanley Basin and Bear Valley. Above these broad bottoms, streams flow through narrower valleys descending from watershed boundaries. Many upper-elevation locations have been modified by glaciation as evidenced by U-shaped valleys and glacial debris. The most extensive moraines flank the west side of the Sawtooth Valley.

Geology

Larson and Rahm (1972) discuss general geology of the Sawtooth National Recreational Area. Rember and Bennett (1979a,b) have compiled most existing geologic information in the study area on 1:250,000 scale base maps.

Three major rock types are present in the study area:

1. The Idaho Batholith, composed of granitic rocks of the Cretaceous Period, is the predominant formation in the study area. This formation makes up most of the western and central portions of the area. Components of the Sawtooth Batholith in the central Sawtooth Range are pink granites of the Tertiary (Eocene) Period.

2. Challis-Volcanic materials predominate in the Yankee Fork basin in the northeastern portion of the study area. These are Tertiary (Eocene) materials composed of rhyolite, tuff, basalt, arko-

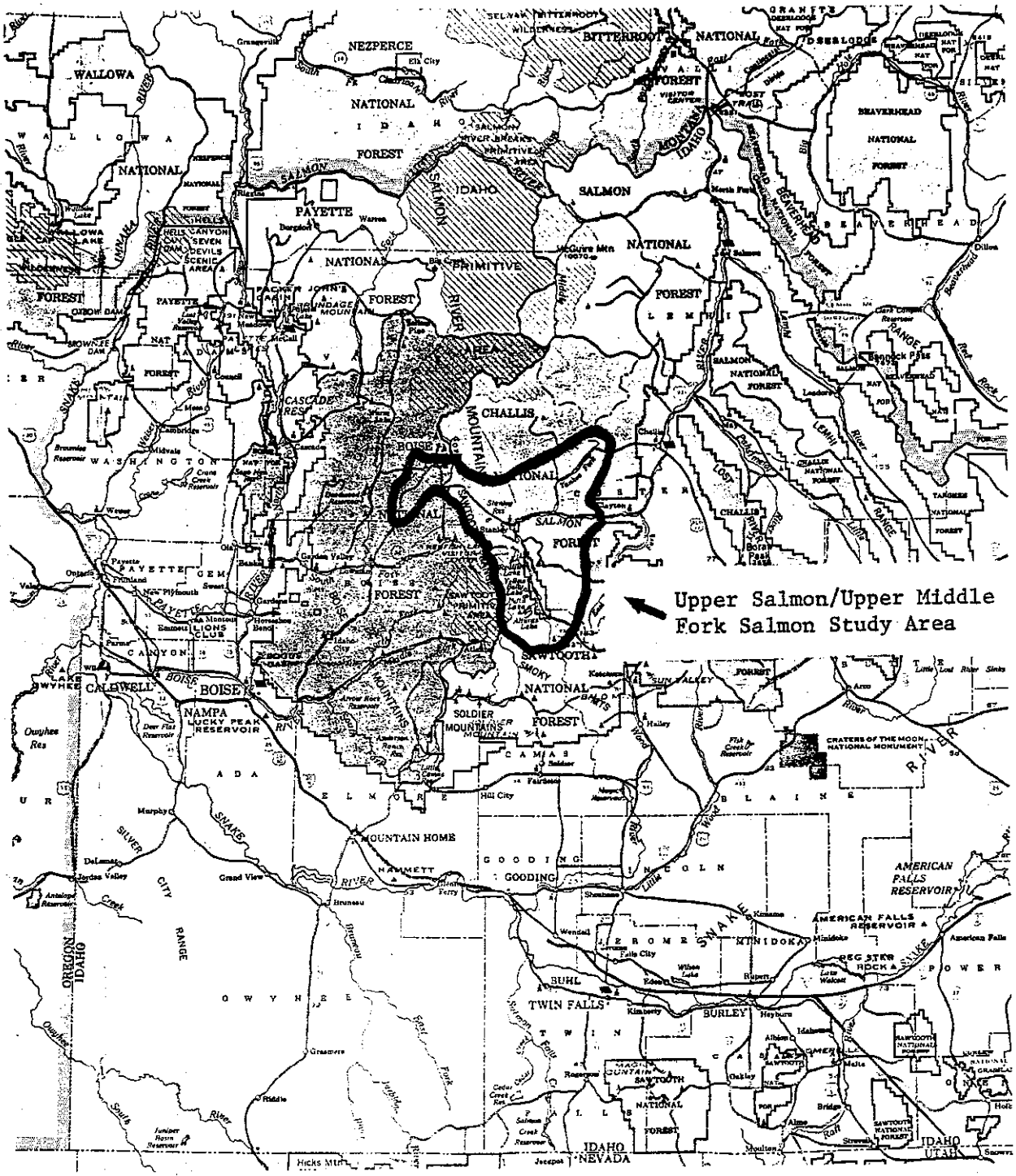

Figure 1. Location of the study area in Idaho.

sic sediments, latite, andesite, rhyodacite and intrusive rocks. Challis Volcanics are also exposed at the southern fringe of the study area in some headwater drainages of the Salmon River.

3. The Wood River formation lies in a roughly north-south belt through the eastern and southeastern portions of the study area. These rocks are primarily Permian and Pennsylvanian age, though local Mississippian/Devonian outcrops are present. The major rock types are limestone, conglomerate, quartzite, calcareous quartzite, and calcareous sandstone. Folding and faulting has occurred as a result of the rising Idaho Batholith.

In addition, a relatively small body of Precambrian biotite schist, the Thompson Peak formation, is exposed in the northern Sawtooth Range. Quaternary glacial deposits and stream alluvium occupy valley bottoms and lowlands throughout the study area.

Climate

Johnson (1978) summarizes weather data for several stations in and around the study area. Stanley is the only station within the study area for which data have been recorded.

Located in a broad montane valley, Stanley is in the Cool Temperate Steppe life zone defined by Holdridge (1967). Average annual precipitation is 259 mm (10.2 in). Average annual temperature is 1.8°C (35.2°F); average annual biotemperature, disregarding low and high extremes, is 6.5°C (43.7°F). The difference between January and July mean temperatures is near 25°C (45°F).

To the east, Challis and May are drier, with mean annual precipitation of 182 mm (7.2 in) and 195 mm (7.7 in), respectively. Stations to the west and north are much wetter. Idaho City receives an average of 606 mm (23.9 in) annually, McCall 688 mm (27.1 in), and Big Creek 698 mm (27.5 in). Data suggest a general decrease in precipitation from west to east through the study area, though topographic effects are locally important. Higher elevations generally receive more precipitation than lowlands, mostly in the form of snow. Stanley receives a third of its annual precipitation from November through January.

Temperature trends are more difficult to infer because of elevation differences between stations. All surrounding stations are warmer than Stanley, but not to a large degree.

Summers in the study area are generally warm, with maximum temperatures to 35°C (95°F). Day-night temperature fluctuations may be great, with morning frost possible in all but the lowest valley bottoms throughout the season. Periods of afternoon thundershower activity provide most summer precipitation; Stanley shows a June peak with about twice

the average monthly precipitation of succeeding summer months.

Winters are cold and snowy, with minimum temperatures below -40°C (-40°F). Valley bottoms are usually snow covered from November through April or May, though snow may fall at the highest elevations year round.

The growing season is relatively short. Bottomland vegetation is generally identifiable from late June through mid to late September. Near the end of this period, severe frost and declining soil moisture render many species unidentifiable.

Vegetation

The flora of the study area represent the montane and subalpine Rocky Mountain flora, though some elements of the Intermountain flora exist near the eastern boundary.

Upland vegetation is primarily dominated by shrubs or trees. Portions of broad valleys and many lower south-facing slopes support climax Artemisia tridentata ssp. vaseyana. Upland draws in eastern portions of the area contain communities of Artemisia tridentata ssp. tridentata.

Lower and middle elevation slopes support forested habitats of the Pseudotsuga menziesii series, while higher valley bottoms and the adjacent mountains support zonal Abies lasiocarpa. Many of the latter are currently dominated by long-term seral stands of Pinus contorta, and mature Picea engelmannii may occupy moist bottomland locations.

Populus tremuloides stands are scattered through the foothills and valley bottoms; such stands are much less extensive than farther south in the Rocky Mountains. Various subalpine meadow, cushion, scree, and Pinus albicaulis communities occur at elevations above the closed canopy upper-montane forests.

Schlatterer (1972) developed a preliminary description of plant communities in a portion of the study area. Steele et al. (1979b) describe virtually all forest habitat types of the area. Hironaka and Fosberg (1979) describe the major upland shrub habitat types of the area.

Land Use

The characteristics of the study area have been modified by settlement, road building, livestock grazing, logging, mining, recreation and tourism.

White trappers entered the area in the early 1800s. Settlement swelled later that century with the discovery of mineral wealth in the Yankee Fork and White Cloud areas, where mining activity continues today.

Stanley is the largest town in the study area with a permanent population of 99 in 1980. Settlement is dispersed on private ranches in many of the larger valleys, which are mostly used for cattle grazing. Irrigated and seeded pastures are common. Most other valleys, meadows, and uplands are public lands administered by the USDA Forest Service, where grazing allotments support both sheep and cattle.

The most important timber harvest occurs on the Boise and Challis NF portions of the study area. Pole cuts of Pinus contorta exist is some drainages surrounding the Sawtooth Valley. Cutting of individual trees for firewood has occurred throughout the area.

Aesthetic and recreational values such as camping, fishing and hunting draw local people and vacationers year round.

CHAPTER IV
METHODS

The methods employed are in accord with criteria outlined by Poulton and Tisdale (1961): There is a concomitant study of vegetation and soil, with a balance between number of samples and intensity of investigation at each sample site. Norton et al. (in press) discuss philosophies and methods of riparian classification.

Field Methods

Sample Site Determination

The large size of the study area required extensive sampling to encompass inherent variation. Streams along which sampling occurred are presented in Figures 2, 3, 4 and 5. Streams were chosen from maps, aerial photographs and reconnaissance to include variation in stream size, valley form, and geology. Experience in the area (Tuhy, 1981) and consultations with Forest Service personnel also influenced stream selection. Sampling emphasis was mostly on lower and middle reaches of streams where management activity commonly occurs. Headwater reaches were less often investigated.

Reconnaissance and aerial photographs were utilized to select portions of valley bottoms for intensive sampling. Valleys were usually reconnoitered from the mouths towards the headwaters, with sampling conducted on the return route.

Initially, a sample plot was established in each distinctly recurring community for each drainage. As concepts of community types began to emerge, communities which had previously been extensively described were sampled less frequently in order to balance the sampling distribution. The range of variation was encompassed by sampling homogeneous communities which did not match emerging community- type concepts.

Nature of Sample Plots

Sample plots were located in communities three to five times the area of the plot. Sample plots were required to be visually homogeneous. The exact location of plots within a community was chosen to depict the "central tendency" of that community; transitional areas near the stand's borders were avoided. All sample plots were referenced on maps or aerial photos while at the site.

Area and Shape. Sample plots measured 5 by 10 m. Fifty square meters is equal to or greater than the minimal areas for herb and shrub strata as suggested by Mueller-Dombois and Ellenberg (1974). This is generally too small an area for sampling a tree stratum, but these are infre-

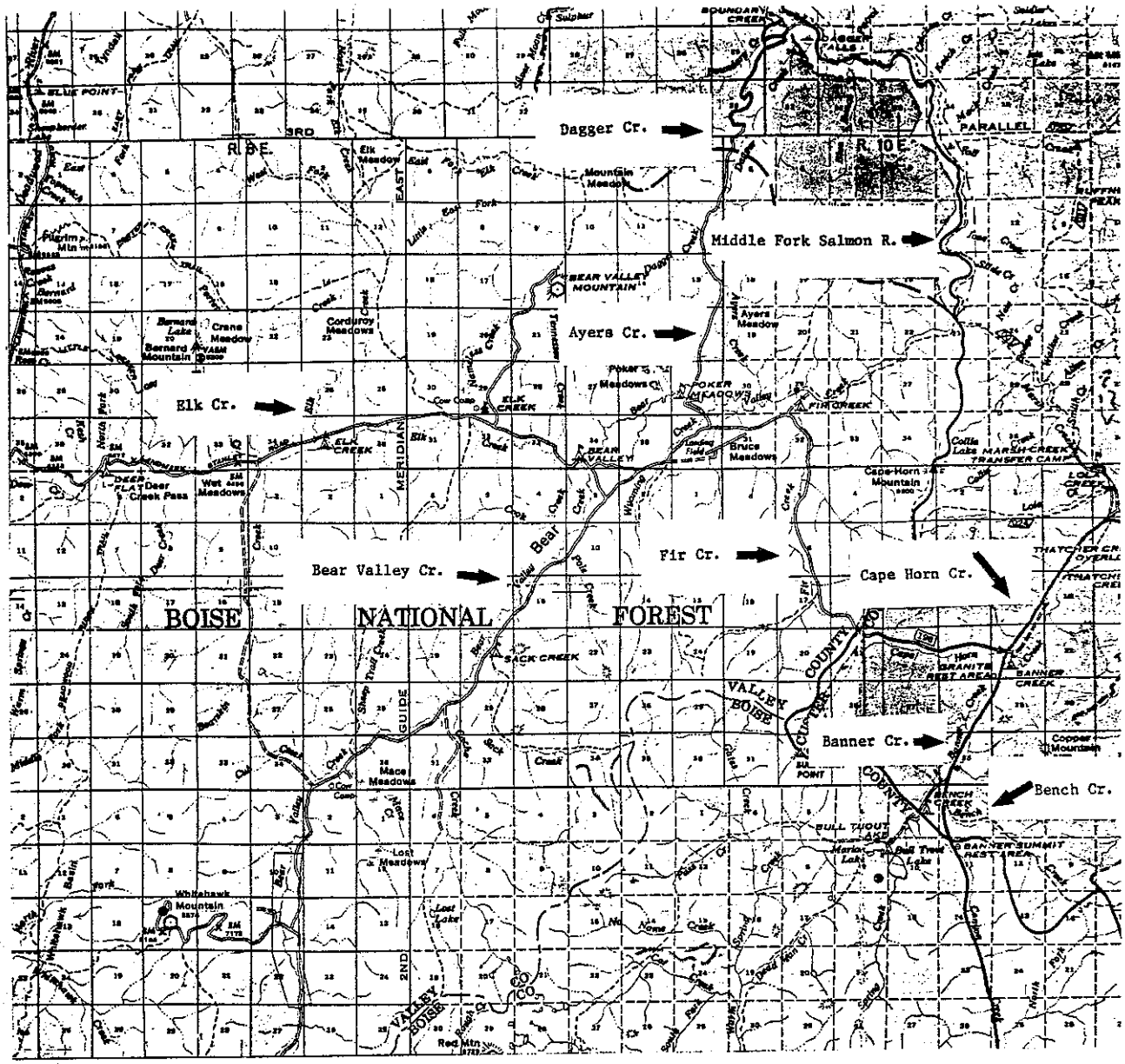

Figure 2. Bear Valley portion of the study area.

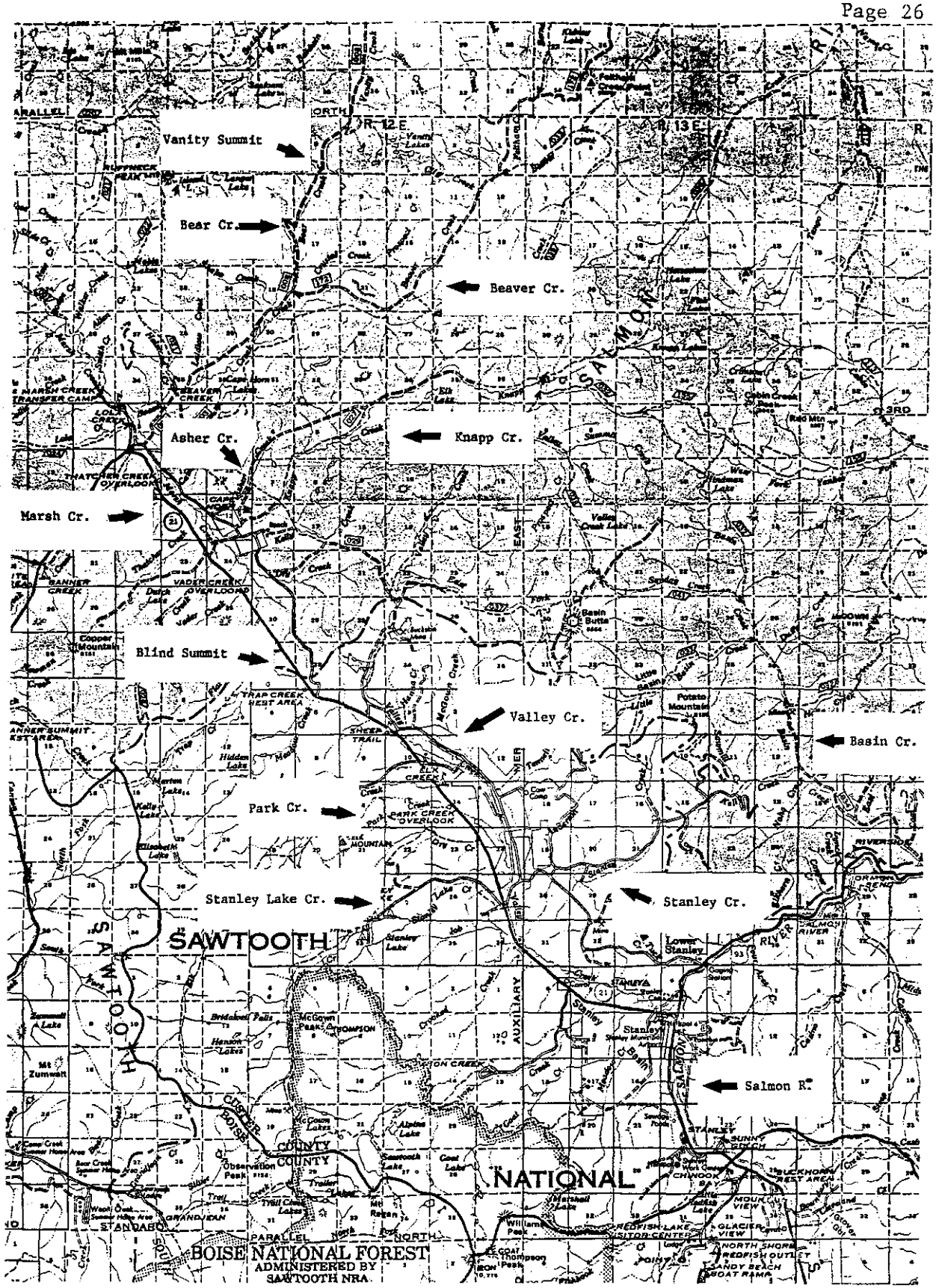

Figure 3. Stanley Basin portion of the study area.

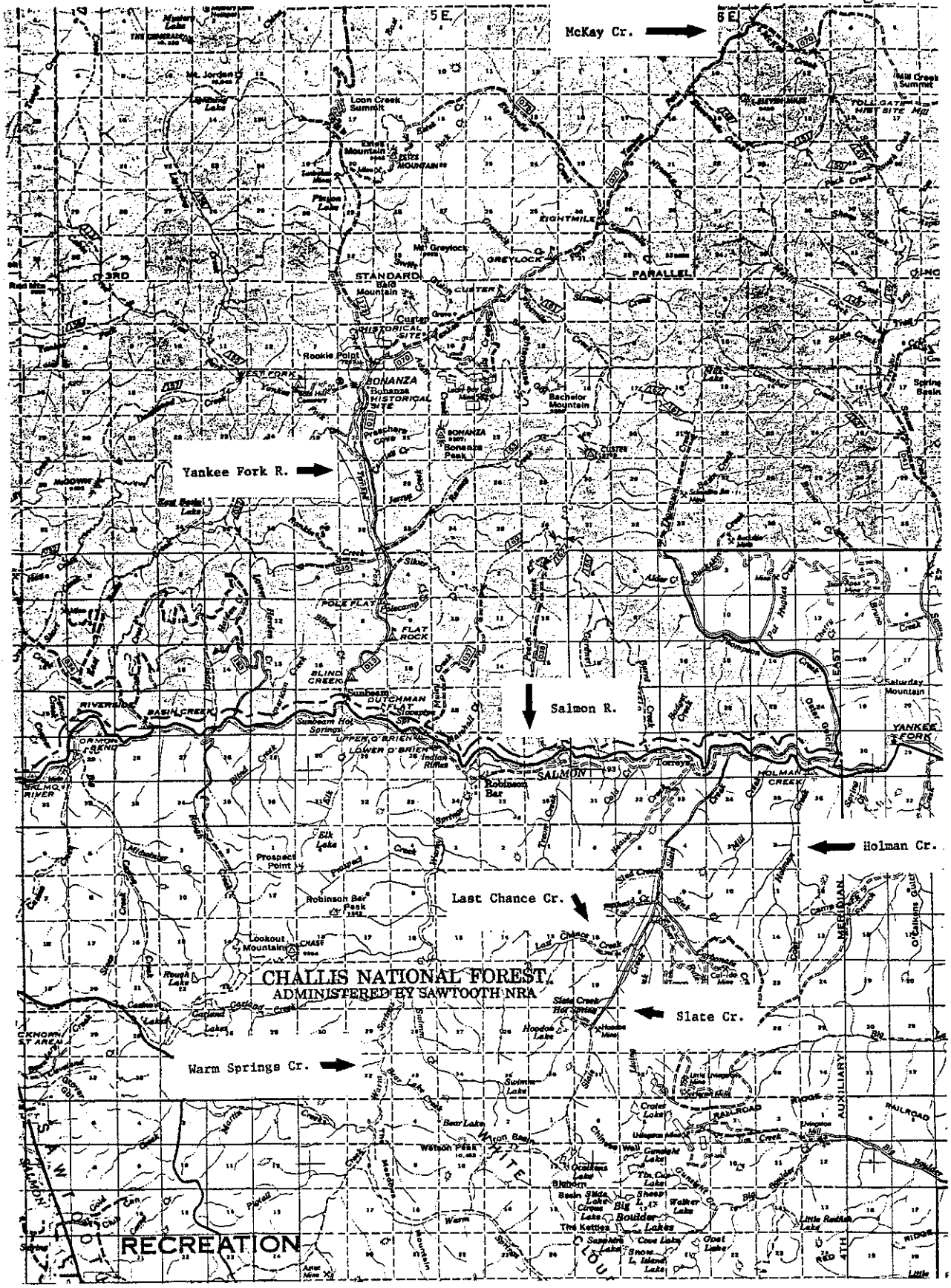

Figure 4. Yankee Fork / White Cloud portion of the study area.

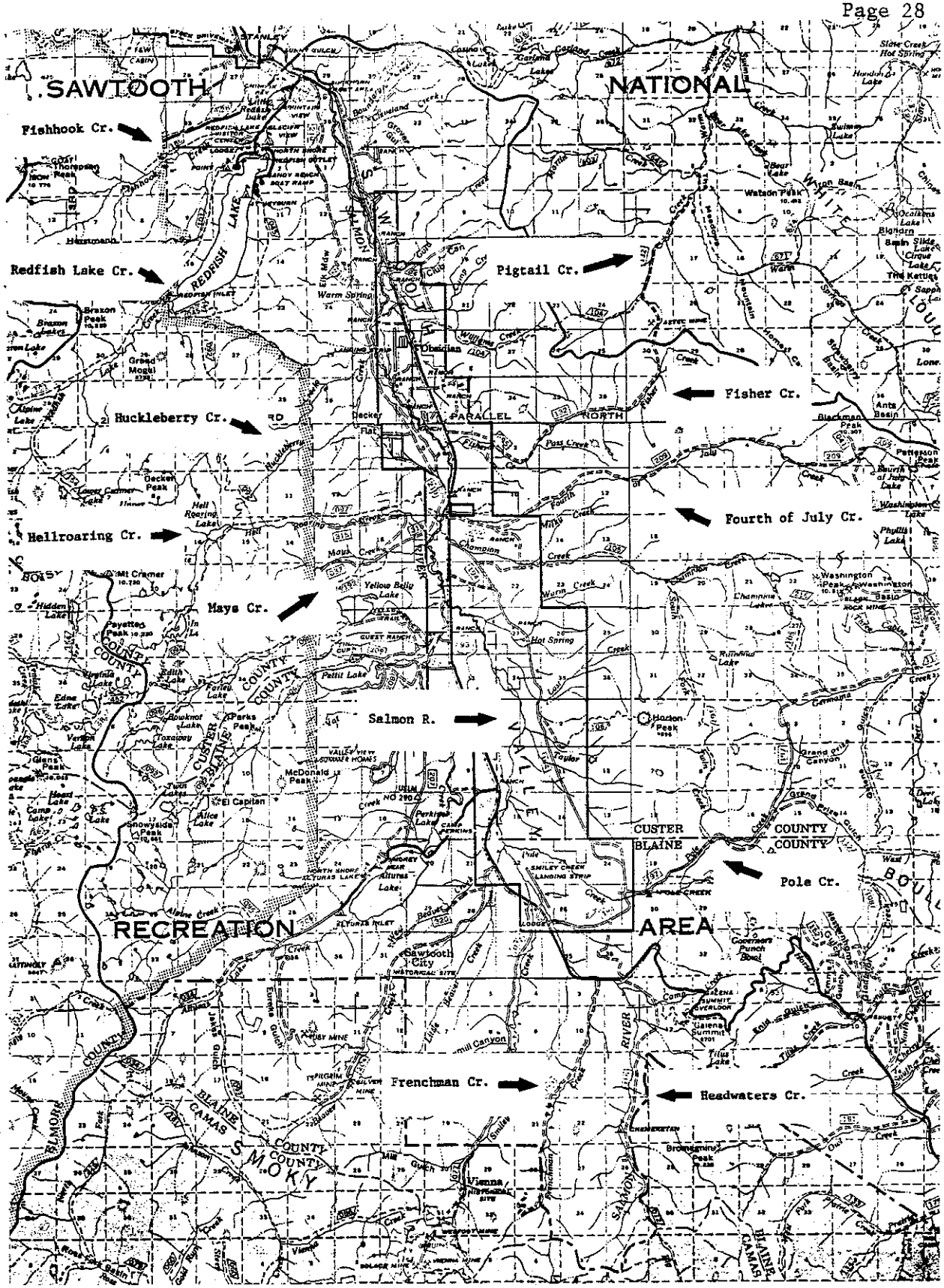

Figure 5. Sawtooth Valley portion of the study area.

quently encountered and play a minor role in the classification.

As small a representative area as possible was desired due to the mosaic-like arrangement of most riparian communities. A rectangular plot shape was used since many riparian communities are elongate, with the long axis parallel to the stream channel. Where a 5 by 10 m rectangle would not fit into a community, as in narrow fringes along small streams, the standard shape (but not the area) was modified.

Coding System. Each sample plot was numbered consecutively and coded following an alphanumeric system. Sample plots of this project coinciding with plots established by Tuhy (1981) were given the same code as in Tuhy. The alphanumeric coding system is explained by example in Figure 6.

MR can R2b

1. MR is Marsh Creek; each stream received a 2- or 3- character abbreviation.
2. can designates a stretch of Marsh Creek, in this case the lower-canyon.
3. R signifies right side of the creek, facing downstream.
4. 2 signifies the second riparian area investigated on the "can" stretch.
5. b signifies the second sample plot at area R2.

Figure 6. Example of plot code.

Stream abbreviation codes are presented in APPENDIX H.

Vegetation

The sampling schedule corresponded, as far as was logistically possible, with optimum stages of plant growth. Lower-elevation streams were sampled first, beginning in late June, 1981. Higher elevation streams were sampled progressively later, ending in early September.

Within each sample plot the following vegetation information was recorded:

1. Species composition, by life form (tree, shrub, forb, graminoid).

2. Percent canopy coverage (to the nearest 1% for species with low coverage and to the nearest 5% for species with greater coverage.) Estimates were periodically calibrated by recording species coverages in ten systematically-placed 0.1 m^2 microplots.

3. Height by species.

4. A count of downed woody materials greater than 3 cm in diameter.

5. In tree-dominated communities, the following abbreviations were made for a minimum of five trees:

   A) Height.

   B) Height to lowest live limb.

   C) Outer crown diameter.

   D) Canopy shape (a rough sketch).

   E) Tree condition.

      a) Live or dead.

      b) Forking (forks below 1.4 m were counted as two trees).

      c) Top: Live, dead or broken.

Unknown plants were collected for identification. Voucher specimens were collected for most species, including all dominant and potential indicator species.

Environmental Parameters

Within each sample plot the following environmental parameters were described:

1. Elevation.

2. Slope and aspect.

3. Valley bottom width and a cross sectional sketch of the valley indicating community location.

4. Microtopography.

5. Disturbance (type and severity).

6. Physiognomy and general appearance of community.

7. Distance from stream and height above stream level (where applicable).

8. Types of adjacent communities and nature of boundaries.

9. Estimates of litter, duff and percent bare ground or surface water.

Elevation was estimated from USGS maps. Slope and aspect were measured with a Brunton compass. Valley bottom widths were visually estimated and grouped into one of three classes (USDA-Forest Service, 1979): 1) <30 m; 2) 30-100 m; and 3) >100 m.

Microtopography and relief were described for each community. Terms used to describe microtopography include: smooth, undulating and hummocky. Undulating refers to topographic variation with elongate raised areas. Hummocky refers to topographic variation with approximately circular raised areas. Adjectives used to describe the average amplitude of undulations and hummocks are defined in Table 2.

Table 2. Adjectives used to describe amplitude of microtopography.

Term	Amplitude (cm)
Smooth	0-2
Relatively smooth	2-5
Slightly hummocky or undulating	5-15
Moderately hummocky or undulating	15-30
Strongly hummocky or undulating	30-50
Very Strongly hummocky or undulating	> 50

The overall form of the community was noted as even, convex or concave.

Adjacent communities were listed in terms of tentative floristic classification and the nature of adjoining boundaries. An exemplary Physical Description form is presented in APPENDIX I.

Soils

A soil profile was described for each sample plot to a depth of one meter or more, or to some depth below the ground water level (gwl) if shallower than one meter. The location of the soil pit was chosen to represent the "cental tendency" of the community in terms of microtopography and physiognomy. Methods of profile description conform to those in Soil Identification-Seventh Approximation (USDA-SCS, 1975a). Definitions and abbreviations used in profile descriptions are adopted from "Definitions and Abbreviations for Soil Descriptions" (USDA-SCS, 1979b).

Depth to the ground water level (gwl) was measured for each profile, or estimated from moisture status and morphological characteristics at and below one meter. The gwl is the minimum depth from the surface to which free water will occupy pits and auger borings. In fine-textured soils, the time necessary for soil pits to fill to the gwl was often considerable. In these cases, gwl was taken as the depth from which water was freely draining.

Soil moisture is maintained at field capacity -- the maximum quantity of water a freely-drained soil will hold -- at a depth above the gwl. Soils at field capacity are near-saturated (except in non-capillary pores). The depth to near-saturated conditions was noted for each profile described. An exemplary Soil Description form is presented in APPENDIX I.

Frequency and Production

In mid-August, three plots from each major community type (as the classification stood at that time) were chosen for subsequent frequency measurement and production estimates.

Frequency. The nested frequency method (USDA-Forest Service, Region IV, 1981) was utilized. The method tabulates the presence of species within four nested microplots.

A length of steel rod was driven into the ground and a 10 m tape stretched through the center of the community. The true bearing of the transect line was measured. Ten replicates of nested frequency were recorded at one-meter intervals along the tape. This is far fewer than the eighty to one hundred suggested for trend studies by the Region IV Range Analysis Handbook, but the limitied size of riparian communities did not allow a large (30 by 30 m) grid including this many samples.

The dimensions of the plot frame are shown in Figure 7.

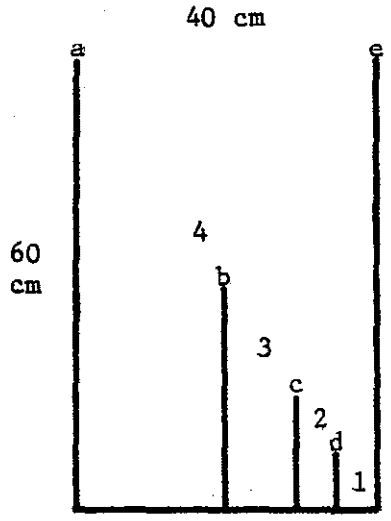

Figure 7. Nested frequency plot frame.

Plots are numbered 1 to 4 from small to large, respectively. The frame was placed at a meter mark and all species rooted in the smallest microplot recorded with a 1. Owing to the nested design of the microplots, these species also occurred in plots 2, 3, and 4. All different species rooted in plot 2 were recorded with a 2. Different species were recorded for plot 3; and finally, those species rooted in plot 4 that were not in 1, 2 or 3 were recorded with a 4.

Percent frequency of a species in microplot 1 is the number of occurences in microplot 1 multiplied by 10. Percent frequency in microplot 2 is the number of occurences in microplots 1 and 2 multiplied by 10. Percentages for 3 account for occurences in microplots 1, 2, and 3; percent frequency in the largest microplot is all occurences multiplied by 10.

The nature of ground cover beneath the five points of the plot frame (a,b,c,d,e) was tallied by category: vegetation, bare soil, water, rock, litter, or moss. Dot tallies were converted to percentages. An exemplary frequency form is presented in APPENDIX I.

Frequency plots were established and data collected for the primary purpose of establishing a reference for future investigations of trend analysis. Data are not extensively evaluated in this study.

Herbage and Browse Production. Production estimates were conducted on the same transect as frequency measurements. Fresh weights of total forbs and total graminoids were estimated using the double-sampling procedure. Ten 0.1 m^2 quadrats were placed at one-meter intervals along the transect line. Fresh weight within each quadrat was estimated; herbage within the first, fifth and ninth quadrats was clipped and weighed. Representative samples of forbs and graminoids were collected at each site for subsequent drying and weighing.

Where a shrub stratum was present, fresh-leaf weight of the shrubs was estimated using the referenece unit biomass procedure (Andrew et al., 1979). The number of shrub-branch reference units was estimated in a 0.5 by 10 m belt along the transect line. Foliage from the reference unit was stripped, weighed and saved for subsequent drying.

A factor to correct for estimation of herbage weights was derived by regressing estimated weights against actual (clipped) weights, and forcing the regression line through the origin by ignoring the y-intercept. Mean fresh weights were converted to dry weights using the dry/fresh ratio of each plot. Production values for shrubby vegetation were calculated using the dry weight of the foliage reference unit.

Production figures are reported within each community type description.

Office Methods

Vegetation

Taxonomic Considerations. J. Tuhy is responsible for identification of all plant taxa. Nomenclature follows Hitchcock and Cronquist (1976) except for nomenclature of shrubby Artemisia species, which follows Winward (1980); however, Artemisia tridentata ssp. vaseyana is refered to as Artemisia vaseyana. A list of riparian species in the study area is presented in APPENDIX G.

Six specific considerations require discussion:

1. Hitchcock et al. (1955) write that "Aster occidentalis var. occidentalis hybridizes ... freely with Aster foliaceus var parryi where the two come into contact." In the study area, most plants in question were readily identified as A. foliaceus var. parryi; however, some populations of smaller plants with middle cauline leaves more than seven times as long as wide were identified as A. occidentalis var. occidentalis. Due to their similarity, all were called A. foliaceus for the cluster analysis. Also, basal leaves of A. foliaceus were not readily distinguishable from those of Erigeron peregrinus and E. coulteri. Most were identified as the Aster, unless flowering Erigeron plants were noted in the vicinity.

2. Populations of Carex athrostachya contained individuals lacking the prolonged bract subtending the inflorescence. These individuals would key near C. microptera, but were not so identified based on the abundance of C. athrostachya in the community.

3. Epilobium glandulosum and E. watsonii differ primarily in the former having turions. Plants from the same population appear inconsistent in this character, regardless of flower color. Absence of turions on an individual does not necessarily mean turions are incapable of occurring. The name E. glandulosum is used for this group of plants.

4. Gentiana affinis and G. calycosa are both wide-ranging species with considerable variation in height, leaf shape, number of flowers per stem and nature of the calyx. Taxonomic difficulties arise primarily in habitats surrounding bogs. The name G. calycosa is used for glabrous plants with generally one flower per stem and leaves generally less than twice as long as wide.

5. Leaf pubescence breaks down as a character for separation of Salix commutata from S. wolfii var. idahoensis. S. wolfii leaves are entire and relatively narrow, while S. commutata leaves may be toothed and are generally wider. Dorn (1977) notes

that the immature leaves of S. commutata (which he calls S. eastwoodiae) have prominent yellow glands along the margin, while the young leaves of S. wolfii usually do not.

6. Salix myrtillifolia and the non-glaucous form of S. rigida var. mackenziana are very similar vegetatively. Hitchcock et al. (1964) separate the two via characters of the fruit: S. myrtillifolia with the capsule pedicel up to 1 mm long; S. ridida var. mackenziana with the pedicel 2-4 mm long. Pedicel lengths on collected specimens covered the range from 0.5-2.5 mm. This report uses S. myrtillifolia as the name for this complex; Dorn (1977) uses S. boothii as the name for non-glaucous leaved plants with pedicels up to 2.5 mm long. Identification by fruit was made more difficult by maturation and abscission of catkins midway through the sampling season.

Cluster Analysis. As an initial step, sample plots were subjectively arranged into similar groups based on floristic data and the expertise of the investigators. A clustering procedure was performed to validate the initial classification.

Cluster analysis was performed on a reduced data matrix. Those plants deemed "unimportant or incidental" to the classification were not considered. A species was not considered in the objective clustering procedure if:

1. Coverage was never greater than 1%, or

2. Constancy was less than 2.5% (<4 plots) and coverage was less than 5%.

Regardless of the criteria, a species could be included in the analysis if judged potentially important by the investigators. 201 of the 301 species indentified were considered in the clustering procedure.

Species coverage values were coded and transformed for subsequent analysis procedures. Values were coded to the midpoint of the range of the coverage class and transformed by taking the square root of the midpoint. Coded and transformed values of coverage classes are presented in Table 3.

Table 3. Coded and transformed cover values for species coverage classes.

Species Coverage Class (%)	Coded Cover Value C	Transformed Cover Value $C^{1/2}$
0-1	0.5	.71
1-5	3.0	1.73
5-10	7.5	2.74
10-15	12.5	3.54
15-25	20.0	4.47
25-50	37.5	6.12
50-75	62.5	7.91
75-95	85.0	9.22
95-100	97.5	9.87

Coded values of species with high coverage have an unacceptably large influence on calculations of pairwise resemblance between plots. Transforming reduces the effect by compacting the range of coded cover values, while retaining a measure of the magnitude of the intervals. The square root transformation gives greater weight to trace coverages, recognizing presence-absence better than coding alone.

The MATRIX program, written by R. Mauk of Utah State University, derived a similarity matrix of all 15,753 plot pairs using the Bray-Curtis coefficient of similarity. This coefficient (Motyka et al., 1950) is defined as:

$$b_{jk} = \frac{2 \sum_{i=1}^{n} \min (X_{ij}, X_{ik})}{\sum_{i=1}^{n} (X_{ij} + X_{ik})}$$

Where $X = C^{1/2}$

i = attributes (species)

j,k = objects (plots)

and b_{jk} assumes values from 0-1.

The CLUSTAR program (Marshall and Romesburg, 1977) is a polythetic agglomerative procedure that defines clusters of sample plots based on stepwise comparison of similarity values (b_{jk}). A dendrogram was constructed using the unweighted pair-group method of arithmetic averages

(UPGMA). The dendogram is a visual representation of floristic similarity among plots, and is presented in APPENDIX D.

Synthesis Tables. Association tables were constructed depicting floristic similarity between plots. Floristic groups were modified from the cluster analysis. Constancy-coverage tables compare floristic characteristics among community types. Association tables and constancy-coverage tables were generated by computer programs written by R. Mauk, Research Associate, Department of Forestry, Utah State University.

Soils/Environmental

Each soil pedon was classified and interpreted for water handling and erosional characteristics.

Taxonomic Classifications. Soil taxa are based on morphology as described for soil profiles. Taxonomic criteria conform to those stated in Soil Taxonomy (USDA-SCS, 1975b). Pedons were classified to the family level.

Taxonomic classifications sometimes did not rigorously conform to criteria of the taxonomic unit (taxon), but were best typified by its concept. The criterion of reduced mottles is especially lacking in rigid taxonomic definitions of Aquic Suborders and Subgroups. These soils are saturated to the surface or within some subsurface horizon for part or all of the growing season, yet reduced forms of iron and magnesium were generally not observed. The taxonomic concepts and morphologic criteria of taxa identified to the Subgroup and family levels are described in CHAPTER I (Soil Taxonomy).

Interpretations. Interpretations of water-handling and erosional characteristics were derived for each pedon. Interpretations were based on field desciptions. Specific interpretations are:

1. Drainage Class. Classes are based on morphological characteristics which reflect the degree of aeration within the soil profile: depth to gwl, textural class, structure, and evidence of oxidation-reduction processes. Classes range from very poorly drained to excessively drained. Criteria for drainage classes are presented in APPENDIX F.

2. Profile Permeability. Permeability is a relative measure of the transmittance of water through the soil profile under saturated conditions. The measure was applied to the horizon most restrictive to vertical water movement between the surface and the gwl.

Permeability is a function of soil texture, structure, OM content, and coarse fragment composition. Criteria of permeability classes are presented in APPENDIX F.

3. Available Water-Holding Capacity (AWC). Available water-holding capacity is a measure of the water that a soil may retain between 1/3 and 15 bar tensions. AWC is a function of textural class, coarse fragment composition, structure, and OM content. AWC was determined for each horizon above 50 cm or to the gwl, if deeper than 50 cm. An average AWC was calculated by summing the proportional depth of horizons to 50 cm or the gwl.

4. Hydrologic Soil Groups (HSGs). Hydrologic soil grouping is used in watershed planning to estimate runoff from snowmelt and precipitation. Groups are determined by those factors influencing infiltration and permeability in addition to the depth to the seasonal gwl. Each HSG is definitive of a runoff potential class. The influences of vegetation, slope and physiography are not considered in HSGs. Criteria of HSGs are presented and referenced in APPENDIX F.

5. Inherent Erodibility (IE). These classes are a measure of the potential soil loss by water erosion. Soil properties which influence erodibility by water are those that affect infiltration and permeability, and those which resist dispersion and transport forces of rainfall and runoff. The presence of organic surface horizons in Aquic Suborders and Subgroups and in Histosols greatly reduces potential soil loss. High OM contents in mineral horizons also reduce inherent erodibility. The interpretation was applied only to the surface horizon of each pedon. Classes are presented and referenced in APPENDIX F.

6. Erosion. Erosion is a field observation of the proportion of surface horizons (15 cm) removed by fluventic or other forces. An inherent assumption of the observation is that the investigator recognizes what has been removed. In some instances (gravel and sandbars) erosion has proceeded to the extent that no sign of surface horizons remains. The degree of streambank sloughing was also noted for communities contiguous to channels. Erosion classes are presented and referenced in APPENDIX F.

Correlation Procedures. Soils and environmental data were condensed and tabulated into matrix form by plot. The matrix was programmed into the VAX/VMS computer system of Utah State University and stored for subsequent manipulation and analysis. Statistical analysis was conducted for plot data, even though plots are not random samples. Statistical analysis has been found to be a powerful tool, even for subjective sampling.

Analysis of Variance (AOV). Statistical measures were calculated for community types derived from floristic analysis. Statistical measures were calculated with MINITAB, a program developed a Pennsylvania State University (Ryan et al., 1981).

Means and standard deviations for each of ten quantitative variables were calculated for groups delineated by floristic analysis. AOV was conducted to determine if mean values of distinct quantitative variables were significantly different between floristic groups. Variables treated in the statistical analysis are:

1. Slope.
2. Elevation.
3. Depth to gwl.
4. Depth to the top of the capillary fringe.
5. Mean percent (volume) of coarse fragments above the gwl.
6. Mean AWC above 50 cm or above the gwl if deeper than 50 cm.
7. Mean percent (volume) of organic soil material above the gwl.
8. Thickness of organic soil material (cm).
9. Thickness of "A" horizons.
10. Mean pH above the gwl.

Fisher's Protected Least Significant Difference (LSD) was utilized in multiple comparisons of statistically significant variables. Subsequently, plots were organized into groups of similar characteristics using cluster analysis procedures.

Cluster Analysis. Soils and environmental data were arranged consecutively by plot number and subjected to cluster analysis using the CLUSTAR program (Marshall and Romesburg, 1977).

"Attributes" are factors determined significant in previous statistical analysis (AOV). "Objects" are plots. Various assemblages of attributes were compared among all objects.

Attributes were first standardized to compensate for differences in the mean and dispersion (Sneath and Sokal, 1973). The standardization formula used is:

$$(X_{ij} - \bar{X}_i)/sd_i$$

where: X = value
$\bar{X}$ = mean value
sd = standard deviation
i = attribute
j = object

Conceptually the CLUSTAR program plots objects in an n-dimensional space and derives a measure of resemblance between objects. The Average Euclidean Distance was utilized as the coefficient upon which subsequent clustering was operant. The formula used in calculating Average Euclidean Distance is:

$$d_{jk} = \left(\sum_{i=1}^{n} (X_{ij} - X_{ik})^2/n \right)^{1/2}$$

Where X = value of attribute

i = attributes

j,k = objects (plots)

and d_{jk} assumes values from $0-\infty$.

Distinct soil, hydrologic and environmental parameters were linearly ranked. This analysis reduced the number of attributes under consideration to a single variable. Results are summarized in relation to mean parameter determinations for given community types.

Synthesis

The classification is based primarily on floristic characteristics. Soil and environmental properties aided the classification of communities transitional between two floristic types. Ten miscellaneous communities have neither floristic nor soil properties in common with described types. Miscellaneous communities were included in cluster analyses but not in statistical tests of AOV. These communities are included in data summaries but are not subsequently discussed.

Statistical and clustering manipulations of environmental, hydrologic and soil parameters were utilized to derive inferences pertaining to ecosystem processes and successional trends of floristic groups. The syn-

thesis of floristic, environmental, hydrologic and soil parameters defines community types.

A key to the classification units was constructed. Some types include communities transitional between described units; such communities do not strictly meet key requirements.

Descriptions of each community type were prepared. These descriptions include the following categories:

1. Location.
2. Floristics and Physiognomy.
3. Adjacent Communities.
4. Production.
5. Environmental Parameters.
6. Soils.
7. Disturbance and Succession.
8. Management.
9. Other Classifications.

Subsequent discussions pertain to habitat types of the study area, community patterns and successional trends, comparison with other riparian classifications, disturbance and management, and a discussion of frequency versus cover as a tool for classification studies.

CHAPTER V
RESULTS AND DISCUSSION

The Classification System

This classification presents seventeen community types (cts) named by indicator plant species. Slashes (/) in a community type name separate different strata; hyphens (-) separate two or more species of the same stratum. This generally follows the work of Henderson and West (1977). Six incidental types of communities are mentioned; these recur so infrequently that too few were sampled to serve as bases for community type classification.

Two-previously described riparian forest habitat types are noted, as are four major non-riparian habitat types common in valley bottoms. The first portion of a habitat type name, followed by a slash (/) is the potential climax dominant overstory. Subsequent portion(s) of the name are the potential climax indicator species in the understory; a hyphen (-) is used to denote a phase, which is a taxonomic subdivision based on consistent minor differences in potential climax species composition. Units of classification are presented in Table 4.

Table 4. Acronyms of the units of classification.

Unit Taxon	Acronym
Community Types	
Agrostis scabra-streambar	AGSC-bar
Alnus incana-Cornus stolonifera	ALIN-COST
Aster integrifolius-Festuca idahoensis	ASIN-FEID
Carex rostrata	CARO
Deschampsia cespitosa	DECE
Eleocharis pauciflora	ELPA
Juncus balticus	JUBA
Pinus contorta/Vaccinium occidentale	PICO/VAOC
Potentilla fruticosa/Danthonia intermedia	POFR/DAIN
Poa pratensis	PO'R
Salix commutata/Carex scopulorum	SACO/CASC
Salix drummondiana/Calamagrostis canadensis	SADR/CACA
Salix geyeriana/Calamagrostis canadensis	SAGE/CACA
Salix spp./Carex rostrata	SALIX/CARO
Salix myrtillifolia/Poa pratensis	SAMY/POPR
Salix wolfii/Carex microptera	SAWO/CAMI
Salix wolfii/Swertia perennis	SAWO/SWPE
Riparian Habitat Types	
Abies lasiocarpa/Calamagrostis canadensis	ABLA/CACA
Abies lasiocarpa/Streptopus amplexifolius	ABLA/STAM
Incidental Riparian Communities	
Artemisia cana ssp. *viscidula*	ARCA
Salix exigua	SAEX
Non-Riparian Bottomland Habitat Types	
Abies lasiocarpa/Carex geyeri	ABLA/CAGE
Abies lasiocarpa/Vaccinium caespitosum	ABLA/VACA
Artemisia vaseyana/Festuca idahoensis	ARVA/FEID
Pinus contorta/Festuca idahoensis	PICO/FEID

Key to Riparian Community Types and Habitat Types

Instructions. To measure or estimate canopy coverages for each species of the community, the key is a quick guide to identification. Identifications may be verified by comparing floristic data with community type descriptions and with synthesis tables presented in APPENDICES B and C.

KEY

1a. *Carex rostrata* and/or *Carex aquatilis* constitute more than 30 % total coverage; *Eleocharis pauciflora* and *Swertia perennis* are absent.

2a. *Salix* spp. total less than 15% coverage.
CARO ct (p. 58)

2b. *Salix* spp. total at least 15% coverage.
SALIX/CARO ct (p. 62)

1b. *Carex rostrata* and *Carex aquatilis* less than 30% total coverage; *Carex buxbaumii* and *Carex saxatilis* usually absent.

3a. *Mitella pentandra*, *Saxifraga arguta*, *Aconitum columbianum*, and/or *Senecio triangularis* at least 5% total coverage; *Calamagrostis canadensis* less than 5% coverage.

4a. *Picea engelmannii* and/or *Abies lasiocarpa* overstory present; *Abies lasiocarpa* reproducing successfully.
ABLA/STAM ht (p. 120)

4b. Trees absent; *Salix monticola*, *Salix drummondiana* or *Alnus incana* present or absent.
Incidental MIPE communities (p. 117)

3b. Not as above.

5a. Streambar sites; bare ground consisting of stones, cobbles, gravel or sand comprises at least half the total area. *Alnus incana* and *Cornus stolonifera* usually absent; other shrubs present or absent.

6a. *Salix exigua* ssp. *exigua* at least 5% coverage.
Incidental SAEX communities (p. 118)

6b. *Salix exigua* ssp. *exigua* less than 5% coverage; *Agrostis scabra* mostly present; other *Salix* spp. present or absent.
AGSC-streambar ct (p. 49)

5b. Floristic and habitat characters not combined as above.

7a. Abies lasiocarpa, Picea engelmannii and/or Pinus contorta overstory present; Abies lasiocarpa reproducing successfully; Calamagrostis canadensis at least 5% coverage; Vaccinium occidentale absent.

ABLA/CACA ht (p. 120)

7b. Not as above.

8a. Populus trichocarpa overstory dominant.

Incidental POTRI communities (p. 119)

8b. Populus trichocarpa overstory absent.

9a. Shrubs total less than 15% coverage; tree overstory absent.

ITEM A

9b. Shrubs total at least 15% coverage; trees present or absent.

ITEM B

ITEM A. Shrubs less than 15% coverage; tree overstory absent.

1a. Eleocharis pauciflora and/or Scirpus cespitosus at least 20% total coverage; Deschampsia cespitosa less than 15% coverage.

ELPA ct (p. 54)

1b. Eleocharis pauciflora and Scirpus cespitosus less than 20% total coverage; where Eleocharis slightly greater, then with less coverage than Deschampsia cespitosa.

2a. Poa pratensis more than 5% coverage; Aster integrifolius, Festuca idahoensis, Stipa occidentalis var. minor and Bromus carinatus absent.

POPR ct (p. 97)

2b. Poa pratensis less than 5% coverage; or Aster integrifolius, Festuca idahoensis, Stipa occidentalis var. minor and/or Bromus carinatus present.

3a. Aster integrifolius, Festuca idahoensis, Stipa occidentalis var. minor, and/or Bromus carinatus present; marginally riparian dry meadows.

ASIN-FEID ct (p. 105)

3b. Above species absent; Poa pratensis less than 5% coverage; moist-to-wet meadows.

4a. Juncus balticus or Deschampsia cespitosa at least 10%

coverage.

5a. Juncus balticus at least 25% coverage, up to 75%; Deschampsia cespitosa up to 50% coverage, but less than Juncus.

JUBA ct (p. 78)

5b. Deschampsia cespitosa at least 10% coverage, up to 50%; Juncus balticus seldom present, never with greater coverage than Deschampsia.

DECE ct (p. 93)

4b. Carex simulata locally dominant; Carex rostrata, Carex aquatilis, Eleocharis pauciflora, Juncus balticus and Deschampsia cespitosa absent or insignificant.

Incidental CASI communities (p. 117)

ITEM B. Shrubs at least 15% coverage; trees present or absent.

1a. Vaccinium occidentale at least 3% coverage; Ledum glandulosum, Lonicera caerulea and/or taller Betula glandulosa may be codominant or dominant; Pinus contorta often present.

PICO/VAOC ct (p. 74)

1b. Vaccinium occidentale less than 3% coverage, usually absent; conifer overstory rare; other characters various.

2a. Salix spp. total at least 15% coverage.

3a. Salix wolfii at least 15% coverage; Salix phylicifolia, Lonicera caerulea and/or taller Betula glandulosa may be present; all other Salix spp. less than 5% total coverage.

4a. Swertia perennis present; Carex aquatilis and Pedicularis groenlandica usually present; Salix phylicifolia or Betula glandulosa sometimes present; surface usually mossy.

SAWO/SWPE ct (p. 70)

4b. Swertia perennis absent; above associates mostly absent; drier sites often containing Carex microptera and Penstemon sp. (which seldom flowers).

SAWO/CAMI ct (p. 89)

3b. Other Salix spp., one or more, total at least 15% coverage.

5a. Salix commutata at least 25% coverage; Salix monticola may be subordinate; Salix drummondiana absent; Carex scopulorum and often Calamagrostis canadensis present.

SACO/CASC ct (p. 66)

5b. Salix commutata usually absent, or sometimes codominant with Salix drummondiana.

6a. Salix drummondiana, Salix monticola and/or Salix myrtillifolia at least 15% total coverage.

7a. Salix drummondiana usually dominant; Salix monticola or Salix commutata sometimes abundant; Calamagrostis canadensis at least 5% coverage.
SADR/CACA ct (p. 81)

7b. Salix myrtillifolia usually dominant; Salix monticola and Salix commutata absent; Poa pratensis present with greater coverage than that of Calamagrostis canadensis, which never exceeds 5%.
SAMY/POPR ct (p. 101)

6b. Salix geyeriana at least 15% coverage; all other Salix spp. total less than 15% coverage; Calamagrostis canadensis often dominant in understory.
SAGE/CACA ct (p. 85)

2b. Salix spp. total less than 15% coverage, often absent.

8a. Alnus sp. and/or Cornus stolonifera dominant.

9a. Alnus incana and/or Cornus stolonifera dominant; understory various.
ALIN-COST ct (p. 113)

9b. Alnus sinuata dominant; Menziesia ferruginea often present; Alnus incana and Cornus stolonifera absent.
Incidental ALSI/MEFE communities (p. 118)

8b. Potentilla fruticosa or Artemisia cana ssp. viscidula dominant; Alnus spp. and Cornus stolonifera absent.

10a. Potentilla fruticosa dominant; Artemisia cana absent; Danthoonia intermedia usually present in understory.
POFR/DAIN ct (p. 109)

10b. Artemisia cana dominant; Potentilla fruticosa or Artemisia vaseyana subordinate or absent.
Incidental ARCA communities (p. 118)

Community Type Descriptions

Descriptions of seventeen major community types are now presented. Descriptions are fabricated from floristic, environmental and soil data as summarized in APPENDICES B through F.

Agrostis scabra-streambar ct
(AGSC-bar ct; ticklegrass-bar ct)

Location. AGSC-bar communities are widely scattered through much of the study area except along small or high-gradient streams. Only rarely do these communities occupy large areas.

Floristics and Physiognomy. Agrostis scabra and Agrostis exarata are usually present, but seldom in large quantities. Species composition is otherwise diverse. Two intergradent subtypes were identified:

1. Sandbars often support Carex lenticularis, Puccinellia pauciflora and Salix exigua ssp. melanopsis. Carex rostrata and Carex aquatilis were observed colonizing some sandbars.

2. Gravel bars typically lack sand-specific plants, and in turn support species seldom found on sandbars. Plants specific to gravel bars include Agropyron caninum, Epilobium glandulosum, Sagina sp. and Stellaria longipes.

Various Salix spp. with below-normal stature may be scattered on these streambars. Alnus incana and Cornus stolonifera are rarely present, never with more than trace coverage. Conifer regeneration may be present in small quantities; overstory is absent.

The predominantly herbaceous vegetation does not form continuous ground cover on these sites. Sandbars are usually more densely vegetated than gravel or cobble bars, but at least 40% bare ground was observed on all AGSC-bar sites. The diffuse panicles of Agrostis scabra are distinctive. Some forbs may be anthocyanic (reddish purple). Gravel bars and sandbars are illustrated in Figures 8 and 9.

Adjacent Communities. A diverse group of communities may border AGSC-bar sites, ranging from wet CARO, to more mesic DECE or SADR/CACA, to dry ASIN-FEID. Boundaries are mostly distinct or clear; adjacent communities occur on soils developed from finer alluvium and are elevated several decimeters or more above streambars.

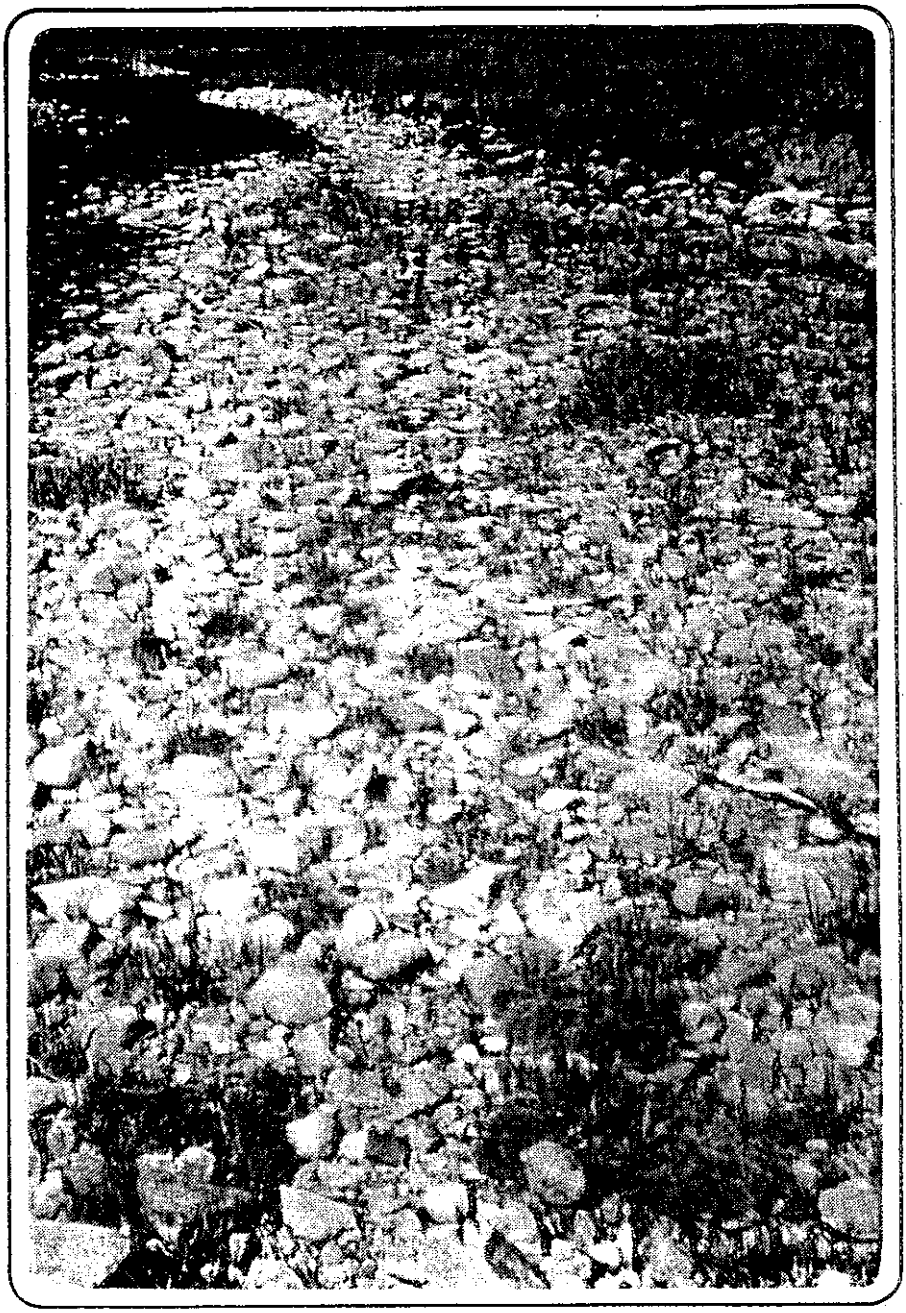

Figure 8. AGSC-gravel bar community.

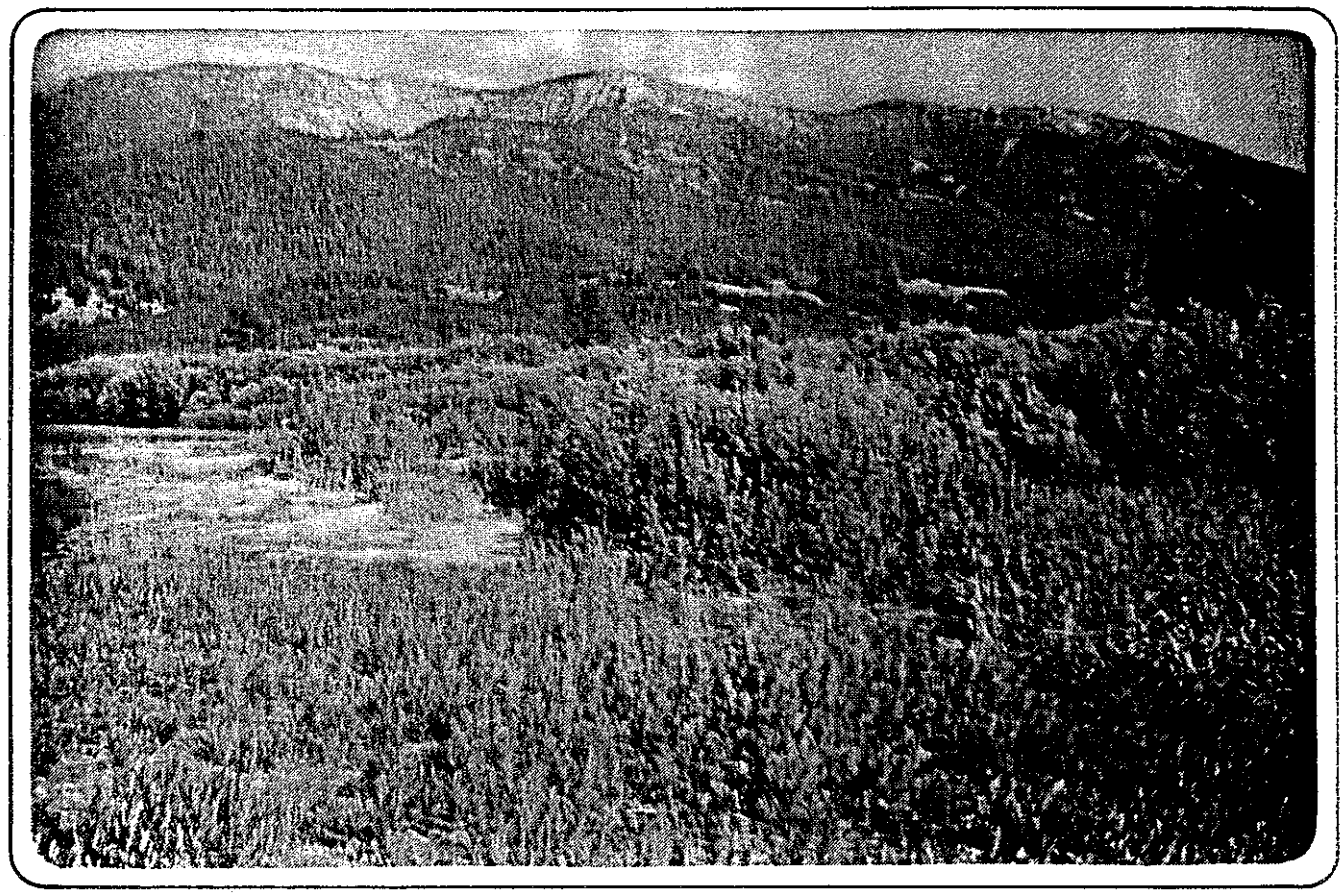

Figure 9. AGSC-sand bar community.

Production. Statistics, in g/m^2, are based on two gravel bars and one sandbar.

		Gravel			Sand
Graminoids -	average:	4;	range:	----;	52;
Forbs -	average:	6;	range:	5- 7;	27;
Total Herbaceous -	average:	10;	range:	9-11;	79;

Environmental Parameters. AGSC-bar communities generally occur along low-gradient streams in wide valley bottoms and fast-moving streams in V-canyons. Most communities are adjacent to flowing water, extending up to 20 m distant and 50 cm higher than normal water levels. Most sites are indundated during high runoff episodes. Other AGSC-bar communities are associated with recently-abandoned channels not yet influenced by deposition of finer-grained sediments.

Microtopography is smooth to undulating, with the long axis of undulatons parallel to stream flow. Most sites have the overall convex shape of steambars, though larger ones are more even. Some bars are developed into several levels or terraces. Slopes of AGSC-bar sites range from 0-3%.

Soils. These communities are the result of severe fluvial erosion. Soils are somewhat to very poorly drained with low to very low AWC above the gwl. Infiltration and permeability to the gwl are very rapid. Inherent erodibility of coarse textured surfaces is low while erosion is severe. Most communities receive fresh sediment or are further eroded by fluvial processes annually or more frequently.

The principal process inherent to AGSC-bar communities is active fluvial erosion and/or deposition. Sandbars are subject to lower energy processes than gravel bars. Taxa identified are Aquic Cryofluvents and Typic Cryaquents. Surface textural classes of gravel bars are sandy-skeletal or fragmental while those of sandbars are sandy.

Gravel bars are relatively homogeneous with depth and exhibit no pedogenic development. These are erosional surfaces.

Sandbars generally incorporate subsurface organic or "A" horizons. Sandbars are predominantly depositional surfaces.

Disturbance and Succession. Fluvial energy is the greatest source of disturbance for AGSC-bar sites. These are among the most ephemeral riparian communities, representing both the initial stage of primary succession and the limit of regression.

Species composition is rich and diverse because there is ample room for colonization, and competitive dominants are nonexistent. Progressive succession is often interrupted by high-energy fluvial disturbance.

Disturbance may decline in frequency and severity as streams migrate and surfaces become built up over normal flood levels by depositional processes. Stabilizing vegetation, usually rhizomatous Carex or Salix spp., may become established. Colonization of sandbars is dominated by Carex spp., and is rapid, as evidenced by depths of organic materials interbedded in annually-deposited alluvium. Gravel bars develop a more diverse herb and shrub complement less spontaneously.

Management. Revegetation and stabilization are often desired where past management practices created unnatural numbers of sand and gravel bars. AGSC-bars reflect poor habitat conditions for survival of fish species. Sand bars tend to revegetate naturally with rhizomatous species such as Carex rostrata or C. aquatilis, followed (after a considerable period) by Salix spp. Gravel bars revegetate less spontaneously, especially where materials are very coarse. Salix exigua ssp. melanopsis and ssp. exigua are successful on such coarse sites, but will hardly succeed under the conditions which originally precipitated the states.

Other Classifications. Tuhy (1981) describes a nearly identical Agrostis exarata-Agrostis scabra ct for the Sawtooth Valley.

Eleocharis pauciflora ct
(ELPA ct; few-flowered spike-rush ct)

Location. ELPA communities are scattered through middle to high elevations of the study area, primarily in the granitic western portion. ELPA communities were not observed among the White Cloud foothills in the eastern portion of the study area.

Floristics and Physiognomy. Eleocharis pauciflora has at least 20% coverage, or somewhat less where Scirpus cespitosus exceeds 20% coverage. Carex simulata may be abundant; communities in the northern part of the area were observed with Carex scopulorum locally dominant.

Shrubs rarely grow in the wet ELPA site proper, but scattered mossy hummocks within ELPA communities often support Vaccinium occidentale, Lonicera caerulea, Potentilla fruticosa, Salix phylicifolia and/or Pinus contorta regeneration.

Deschampsia cespitosa is seldom present, never with more than 15% coverage. Tree overstory is absent.

ELPA communities are open, turfy mats which are resilient to the step and tremble when impacted for several decimeters around. An ELPA community is pictured in Figure 10.

Adjacent Communities. PICO/VAOC and DECE communities are most often adjacent to ELPA sites. Boundaries are generally clear to gradual, though complex mosaics were observed. Shrubby hummocks within ELPA communities are fragments of the PICO/VAOC ct. Small patches of Carex rostrata, C. aquatilis, C. buxbaumii or C. saxatilis may occur around pools or rivulets in the midst of ELPA communities; boundaries are generally clear. SACO/CASC communities are sometimes adjacent to ELPA sites.

ELPA bogs are often elongate openings surrounded by upland forests representing the ABLA/VACA and ABLA/VASC hts.

Production. Production figures in g/m^2, are based on three sample sites.

Graminoids -	average:	87;	range:	85- 92;
Forbs -	average:	3;	range:	0- 8;
Total Herbaceous -	average:	90;	range:	85-100;

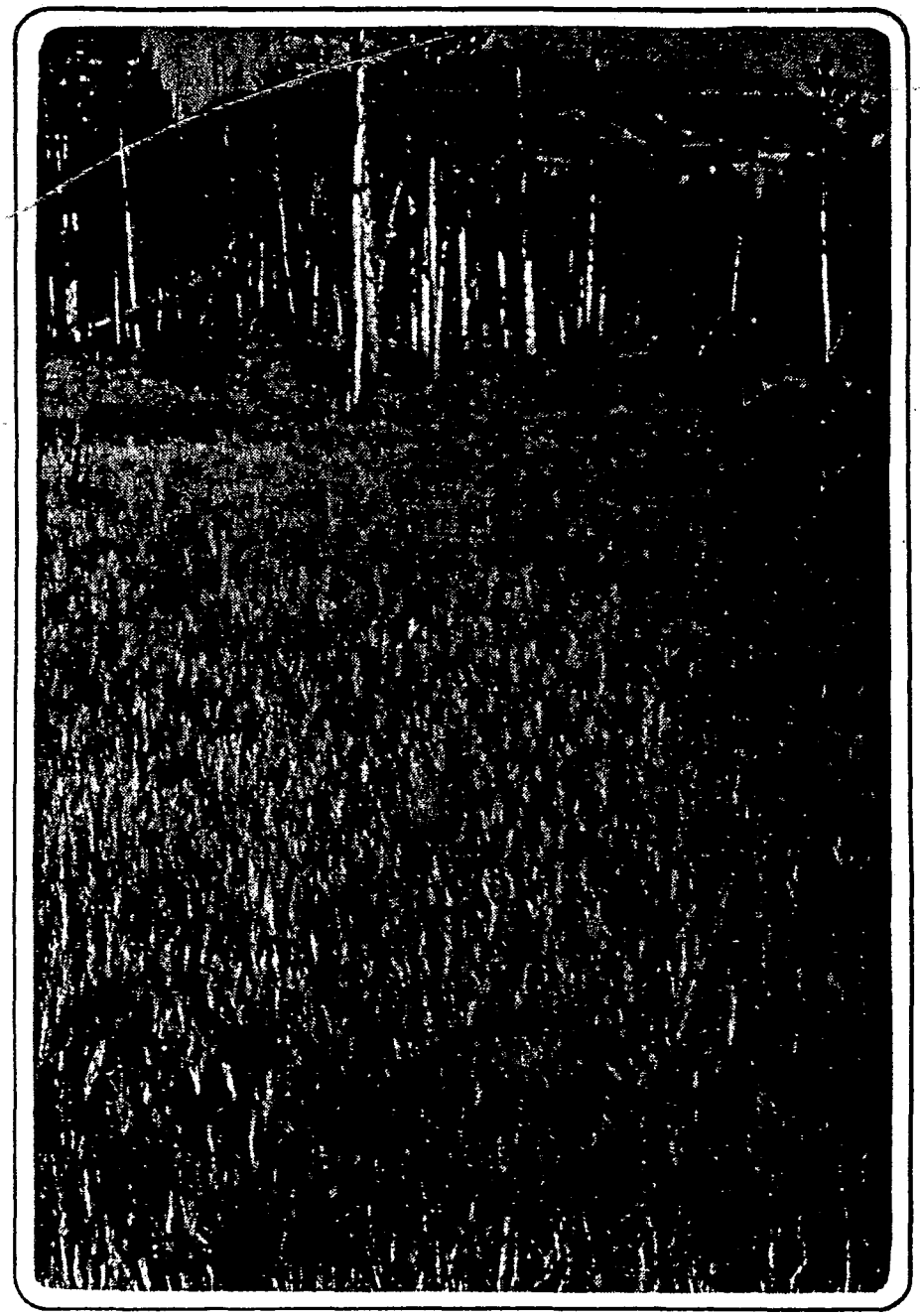

Figure 10. ELPA community

Environmental Parameters. ELPA communities usually occur in broad valleys. Most are in open bogs with dispersed water drainage. Such sites may occupy large portions of valley bottoms or adjacent toeslopes; some are source areas for small streams as near Cape Horn Summit and Mill Creek Summit. ELPA communities were seldom observed adjacent to large streams. One community was noted along a low-gradient, meandering portion of Hell-roaring Creek.

Microtopography is moderately hummmocky to clumpy resulting from tufts of vegetation. Small drainage channels are common. Most ELPA communities are slightly concave; a few were observed in convex positions. Slopes generally range from 0-4%, although some communities were observed near valley headwaters with gradients up to 15%.

Soils. ELPA communities are wet to saturated to the soil surface for most or all of the summer season. Soils are very poorly drained with rapid infiltration and moderate permeability to the gwl. Inherent erodibility of surface horizons is low and little erosion, except for shallow drainage channels, was noted. Available water-holding capacity above the gwl is generally high.

As a result of near anaerobic conditions, the rate of organic matter proliferation greatly exceeds that of subsequent mineralization. Mineralization of OM occurs to a somewhat greater degree in ELPA communites which are transitional to drier sites but to a lesser degree than OM proliferation.

Most taxa are Typic Cryaquents and Histosols. Typic Cryaquents commonly have an organic surface horizon subtended by fine-loamy or finer mineral material. These soils are intergrades to Histosols.

All Histosols identified are of the Terric Subgroup. The degree of OM decomposition ranges from Fibric (least decomposed) to sapric (most decomposed). Mineral horizons subtending organic horizons are fine to coarse textured and often incorporate angular gravel or intermediately weathered rock material.

A Histic Cryaquoll and an Aquic Cryofluvent were also described. The former has a thin organic surface horizon, subtended by a horizon of mineralized OM accumulation (Mollic epipedon). The gwl of this system fluctuates on a seasonal or annual basis. The Aquic Cryofluvent is a wet soil characteristic of fluventic depositional processes. These pedogenic characteristics are atypical of ELPA communities.

Disturbance and Succession. Disturbance is generally low in ELPA communities. This type appears to be an early successional stage in response to inundation. The principal process affecting these systems is OM proliferation. Much of this proliferation is in the form of bryophytes.

ELPA communities are as stable as the hydrologic parameters they reflect. Communities may enlarge as a function of OM proliferation, the principal process affecting these systems. OM has a very high matrix potential (water absorption capacity). The vertical accretion of OM extends the vertical (and consequently the horizontal) limits of the capillary rise above the gwl. Thus, the proliferation of OM effectively extends the limits of near-saturated conditions.

Dead Pinus contorta individuals up to 15 m tall were noted in some communities. Fibrous woody material was observed in subsurface organic horizons of some profiles. Pinus regeneration on hummocks of ELPA sites is of low vigor and usually dies before sapling-sized. The contention is that large, dead trees matured under drier conditions. Should ELPA sites become drier, in response to natural or artificial changes in drainage, OM proliferation would cease to dominate the system and rapid OM mineralization would proceed until a new, more mesic state of equilibrium was reached. Invasion by species from surrounding communities (Pinus contorta, Vaccinium occidentale, or Deschampsia cespitosa) seems likely.

As evidenced by standing-dead Pinus contorta individuals within some ELPA communities, the rise and fall of this type may be rapid.

Management. Little evidence of grazing was observed on sites open to livestock. Communities are resilient to minor disturbance. The management of these systems may be reduced to management of hydrologic parameters inherent to ELPA communities.

Hydrologic parameters are principally affected by water drainage into and out of these systems. Drainage may be affected by channeling, down-cutting of streams, and/or sedimentation. Such alteration in drainage may be in response to changes in hydrologic parameters (principally runoff) of adjacent communities resulting from land uses which affect surface characteristics. Land uses thought detrimental to upslope communities (logging, mining, grazing, road building) result in increased sediment loads in runoff. These uses may favor proliferation of ELPA communities, assuming the increased runoff does not incur erosion of channels which would drain bogs.

Other Classifications. The Scirpus cespitosus-Carex livida ct described by Tuhy (1981) is included in the broader ELPA ct. Jensen and Tuhy (1981) observed ELPA-dominated communities on the north slope of the Uinta Mountains, Utah.

Carex rostrata ct
(CARO ct; beaked sedge ct)

Location. CARO communities are located at lower and middle elevations throughout the study area. They usually occur in small patches but may cover large, continuous areas.

Floristics and Physiognomy. Carex rostrata and Carex aquatilis have more than 30% canopy coverage, alone or together. Most communities contain both species, either codominant or with C. rostrata dominant. A few plots lack C. aquatilis or C. rostrata. One community described has over 30% Carex buxbaumii, Carex saxatilis and Carex aquatilis; such communities, most often observed along Hellroaring Creek, are included in the CARO ct. Galium trifidum and Epilobium glandulosum are frequently present.

Eleocharis pauciflora, Juncus balticus, Deschampsia cespitosa, and/or Poa pratensis are generally absent, but may be present in small quantities on sites transitional to other types. Shrubs total less than 15% coverage. Trees are generally absent, though one marshy site with Pinus contorta overstory was described.

These communities are lush swards of Carex rosrata and/or Carex aquatilis over 5 dm tall on undisturbed sites. Density of the vegetation usually obscures sight of the associated herbs. Stunted Salix spp. may be scattered within the communities. A typical CARO community is illustrated in Figure 11.

Adjacent Communities. SALIX/CARO and drier herbaceous communities of the DECE and POPR cts most often border CARO sites. Boundaries with the SALIX/CARO ct are gradual to diffuse. Other boundaries are generally clear but range from distinct to diffuse.

Other adjacent communities observed include those of the JUBA, PICO/VAOC, SAWO/SWPE, AND SAMY/POPR cts.

Production. Figures, in g/m^2, are based on three sample sites.

Graminoids -	average: 412;	range: 189-671;
Forbs -	average: 3;	range: 0- 6;
Total Herbaceous -	average: 415;	range: 189-677;

Environmental Parameters. CARO communities most often occur in wide, flat bottoms but may exist wherever water is ponded or moving slowly.

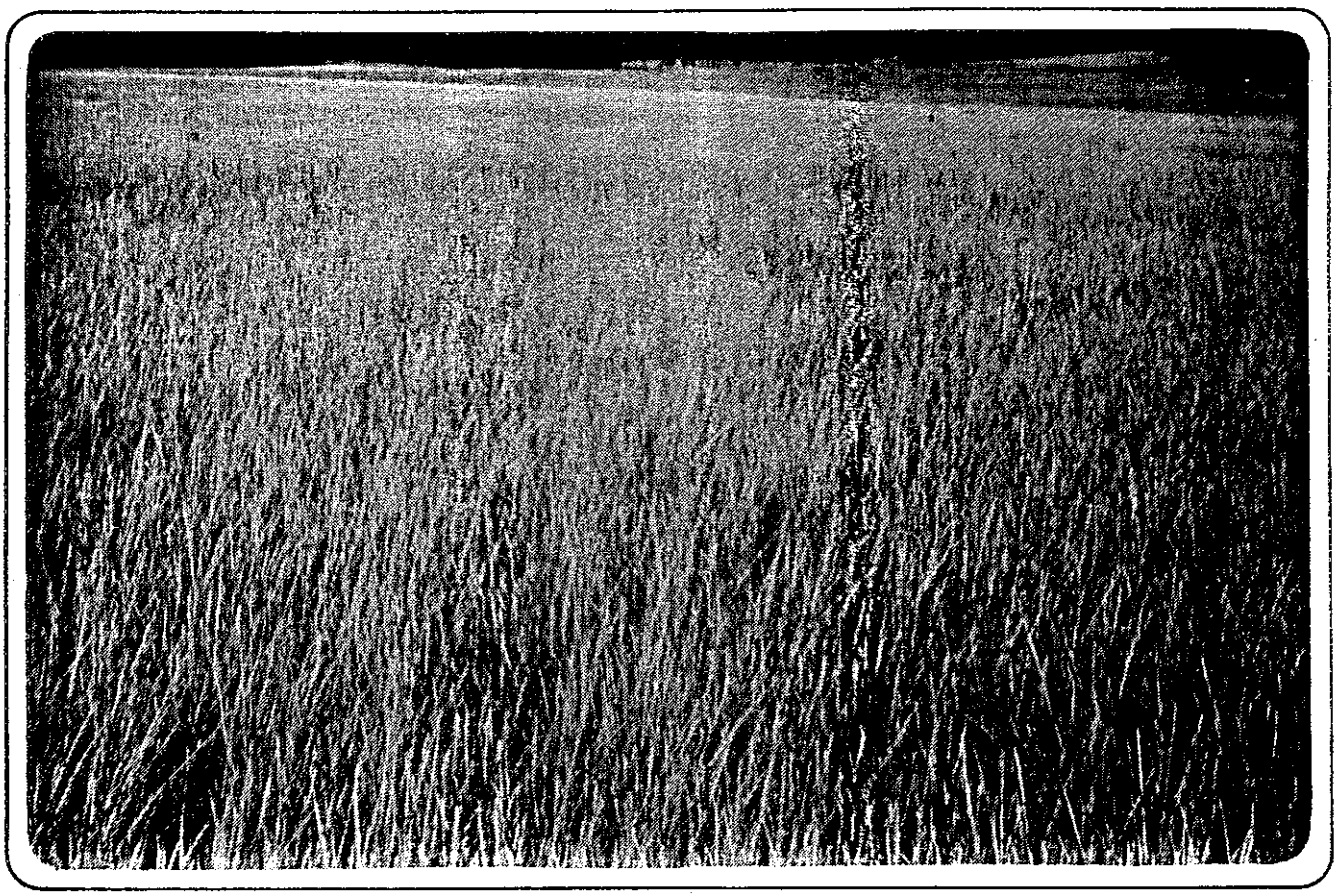

Figure 11. CARO community.

Sites may be adjacent to low-gradient, meandering streams, where the Carex sward forms a low, overhanging bank. Communities were observed around beaver ponds and potholes where water flow is slow or stagnant; Carex rostrata can grow in standing water 30 cm or more deep, such sites being transitional to aquatic habitats. CARO communities may occur in depressions on otherwise upland benches, and sometimes are perched on wet terraces and toeslopes. Sites with nearly pure Carex aquatilis tend to be somewhat drier than those dominated by C. rostrata. Most sites have less than 6% slope, but some toeslope communities were observed with gradients up to 20%.

Microtopography ranges from smooth to moderately hummocky. Some areas are "clumpy" where the Carex has formed tufts. Sites near beaver ponds may be dissected by shallow to deep channels; these may be dry by midsummer or contain water throughout the season. Most communities occur in concave or even positions.

Soils. CARO communities are generally wet at or near the soil surface for most or all of the growing season. Soils are often comprised of alternating layers of coarse-textured mineral and organic materials. Soils are somewhat poorly to very poorly drained with moderate to moderately rapid permeability to the gwl. While mean available water-holding capacities (AWC) of these soils are contingent upon the presence and thickness of organic horizons, AWC of the mineral fraction is low to moderate. Inherent erodibility ranges from low to moderate and erosion ranged from none to moderate. Moderate erosion is in the form of beaver or drainage channels.

Two pedogenic processes dominate the resultant morphology of these soils:

1. Fluventic deposition of relatively coarse textured mineral material;

2. Organic matter proliferation.

The degree to which one process dominates over the other, and/or the periodicity of change in the dominant process, is largely a function of position.

The morphology of streamside soils is characteristic of fluventic deposition: Organic horizons and mineral horizons with varying degrees of OM accumulation separate coarse-textured alluvium of distinct fluventic events. Communities occurring away from streamside positions are generally characterized by a greater degree of OM proliferation and less sedimentation.

Most soils identified are Typic Cryaquents. These soils have ground water levels (gwls) at or near the surface for most of the growing season

and often have a relatively thick organic epipedon. Other soils saturated within 50 cm of the surface for most of the season and with OM distribution characteristic of fluventic deposition are Aquic Cryofluvents. An Aquic Cryoboroll and two Histosols were also described. The former taxon is transitional to a drier type. Communities positioned above the floodplain in concavities or on toeslopes with subsurface lateral drainage are generally of organic character, some to the extent definitive of Histosols.

Disturbance and Succession. Cattle prefer C. aquatilis to C. rostrata. Only rarely was cattle grazing noted to be severe. Fluctuations in groundwater levels resulting from recent or ongoing beaver activity affect CARO sites. The result may be an aquatic environment or fine-grained sedimentation over the community.

CARO communities appear to be an initial stage in the primary succional filling in of beaver ponds and wet depressions, and in the initial "scabbing over" of low-gradient, eroded streambanks with moderately-coarse textures. Subsequent vertical accretion, OM accretion and in-situ pedogenesis may result in trends toward more mesic (less wet) communities with Salix spp. and/or drier-site herbs. Alternatively, OM proliferation without concurrent mineralization may result in trends towards SALIX/CARO communities characterized by deep organic soils.

Management. When adjacent to stream channels, CARO communities form a dense sward which interfaces with the aquatic environment or form steep sided overhangs. The tough, fibrous roots and rhizomes of C. rostrata are an excellent deterrent to the lateral force of stream erosion. Although resistant to lateral erosional forces, streambanks with CARO communities are highly susceptible to sloughing under heavy loads. This most often occurs at the interface between mineral and organic horizons. Sloughing is often associated with cattle grazing and less frequently or to a lesser extent with sheep.

Other Classifications. The CARO ct includes the Carex rostrata-Carex aquatilis and Carex buxbaumii-Carex saxatilis cts described by Tuhy (1981). These communities are ecologically similar, but may be separated for intensive purposes. Norton et al. (1981) describe a nearly identical CARO ct in western Wyoming. Jensen and Tuhy (1981) found a similar CARO ct on the north slope of the Uinta Mountains, Utah. Padgett (1981) separates a similar group of communities in eastern Oregon into distinct CARO and CAAQ cts.

Salix spp./Carex rostrata ct
(SALIX/CARO ct; willow/beaked sedge ct)

Location. SALIX/CARO communities are scattered throughout the study area, mostly at lower and middle elevations. They seldom cover large continuous areas.

Floristics and Physiognomy. The herbaceous stratum contains at least 30% coverage of Carex rostrata and/or Carex aquatilis. Calamagrostis canadensis is often present, sometimes with appreciable coverage, but is not dominant. Galium trifidum is frequently present. Poa pratensis is seldom present, never with over 5% coverage; Swertia perennis is absent.

The shrub stratum contains at least 15% coverage of one or more Salix species. Salix wolfii and/or Salix phylicifolia may form a low stratum (< 15 dm) without a taller shrub stratum. Salix drummondiana, Salix myrtillifolia and/or Salix geyeriana may form a stratum taller than 15 dm. A substratum of Betula glandulosa is sometimes present. Salix commutata was not observed above C. rostrata understory. Although conifer regeneration is sometimes present, overstory is absent.

Scattered to dense shrubs surmount a marshy Carex sward with few other species visible from a distance. Figure 12 depicts a typical SALIX/CARO community.

Adjacent Communities. Herbaceous CARO communities most often adjoin SALIX/CARO sites; the two may form a mosaic over large portions of wet valley bottoms. Boundaries range from clear to diffuse.

Many other adjacent communities were observed , from wet ELPA, to mesic DECE and SAMY/POPR, to dry ARVA/FEID communities. Boundaries with wet sites are various; with dry sites boundaries are generally distinct.

Production. Figures, in g/m^2, are based on three sample sites.

Graminoids -	average:	115;	range:	51-143;
Forbs -	average:	0;	range:	0- 0;
Total Herbaceous -	average:	115;	range:	51-143;
Shrubs -	average:	35;	range:	23- 45;
Total -	average:	150;	range:	74-188;

Environmental Parameters. SALIX/CARO communities were observed in all valley widths and forms except narrow V-canyons. They are often found in the vicinity of beaver ponds and on seepy toeslopes. Communities gen-

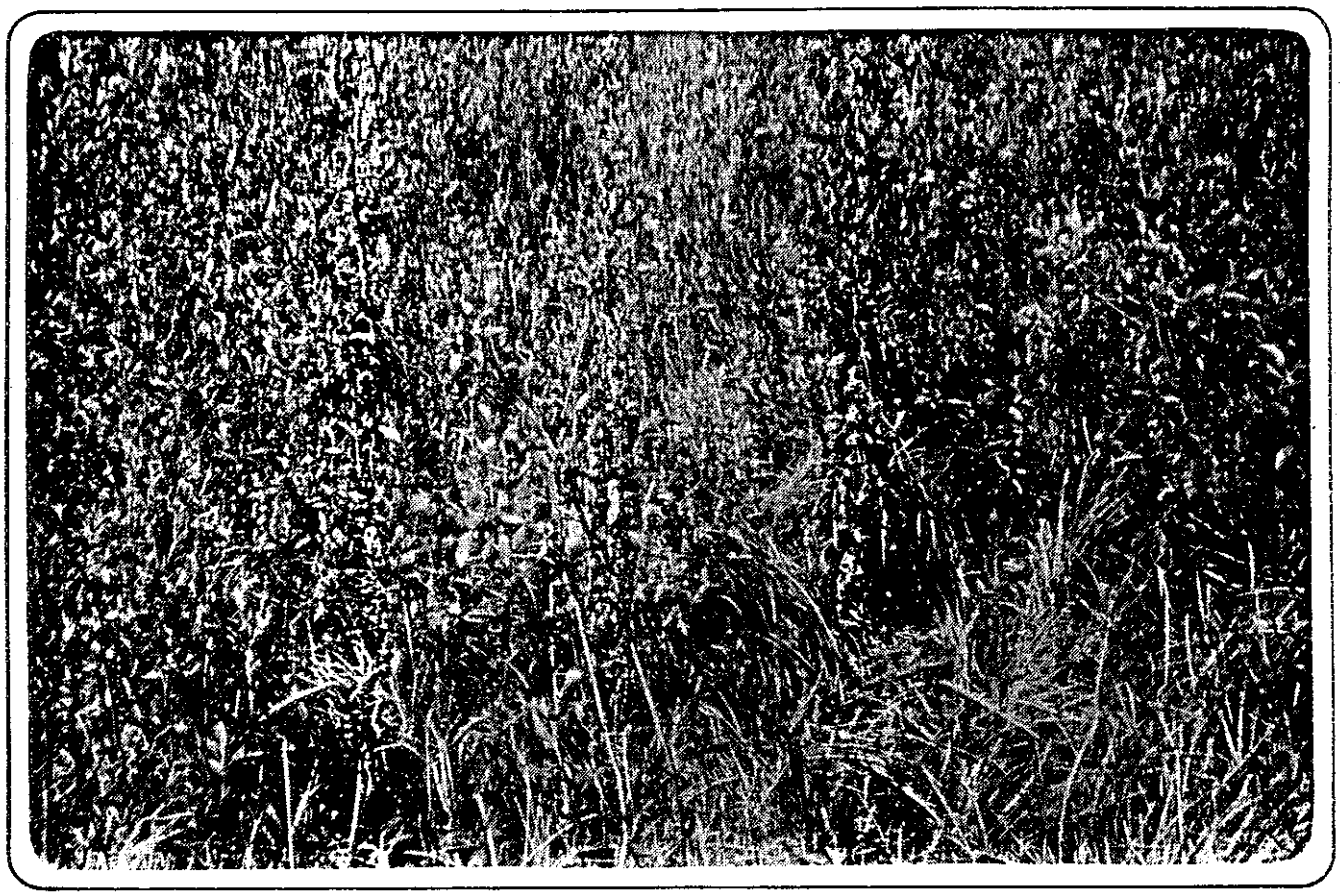

Figure 12. SALIX/CARO community.

erally occur in concavities and develop toward even or slightly convex surfaces. Slopes range from 0-4%; higher gradients reflect positions in small drainages and on toeslopes. Microtopography is often undulating or hummocky; clumpiness is sometimes imparted by tufts of Carex spp.

The drainage of SALIX/CARO communities is sometimes dispersed in a complex network of relatively deep, narrow channels. Depth of these channels often corresponds to depth of surface organic horizons. Channels are active through most of the season. A word from experience - channels may be hidden in lush vegetation.

Soils. These communities are wet at or near the surface for most or all of the growing season. Soils are poorly drained. Infiltration rates are generally rapid with moderate to moderately slow permeability to the gwl. Available water-holding capacity above the gwl is largely a function of presence and thickness of organic horizons while AWC of mineral horizons is generally on the upper end of moderate. Inherent erodibility ranges from low to moderate and erosion is slight to moderate. Where moderate, erosion is in the form of beaver and drainage channels.

Processes dominating SALIX/CARO communities are similar to those of CARO sites, although advanced to a somewhat greater degree. SALIX/CARO soils often have one or more fine-textured mineral horizons over coarser mineral horizons characteristic of CARO communities. Also, OM proliferation has advanced to a somewhat greater degree in SALIX/CARO communities.

Taxa identified are Typic Cryaquents, Typic and Cumulic Cryaquolls, Aquic Subgroups of Cryofluvents and Cryorthents, and Terric Subgroups of Borohemists and Borosaprists. Soil taxa are generally those described for CARO communities.

Disturbance and Succession. Beaver frequently influence SALIX/CARO communities both in modifying the hydrologic parameters of areas and in harvesting the vegetation for consumption and construction. Browsing was observed in some communities with lesser shrub densities.

SALIX/CARO communities appear to develop from CARO communities. Transitions may be associated with periods of fine-textured deposition and/or OM accretion.

If processes of fine-grained sedimentation, vertical OM accretion and in-situ pedogenesis continue, drier riparian species may encroach and become dominant. More rapid succession to drier types may result from changes in external drainage of the systems, such as breached beaver dams.

Management. Livestock seem to prefer drier adjacent communities, thus SALIX/CARO communities are not sensitive indicators of grazing lev-

els. The turfy Carex sward is fairly resistant to trampling except when soils are very wet. Where adjacent to streams, Carex spp. reduce streambank erosion resulting from fluvial forces while Salix spp. bind surfaces and protect against sloughing, even under moderate loads.

Other Classifications. Tuhy (1981) describes a SALIX/CARO-CAAQ ct in the Sawtooth Valley which is virtually identical , except that it excludes Salix spp. less than 15 dm tall. Norton et al. (1981) recognize two shrub types in western Wyoming with CARO understory, dominated by Salix wolfii or S. boothii (=S. myrtillifolia). Jensen and Tuhy (1981) note CARO understories surmounted by Salix wolfii, S. phylicifolia, and S. geyeriana on the north slope of the Uinta Mountains, Utah; final classification may recognize a combined Salix overstory.

Salix commutata/Carex scopulorum ct
(SACO/CASC ct; undergreen willow/Holm's rocky mountain sedge ct)

Location. SACO/CASC communities occur in western and northern portions of the study area, primarily along upper reaches of streams. Stands are scattered, being the least often encountered among the types described.

Floristics and Physiognomy. Salix commutata has more than 25% canopy coverage, and is the dominant shrub. Salix phylicifolia and/or Lonicera caerulea may be present. If present, Vaccinium occidentale has less than 3% coverage; Salix drummondiana is absent. Conifer regeneration may be a minor component, but overstory is absent.

Carex scopulorum is present and either dominates the herbaceous stratum or is codominant with Calamagrostis canadensis. Galium trifidum has high constancy, and some sites contain a complement of wet site forbs such as Aconitum columbianum, Caltha biflora and others.

Where well developed, the silver-green Salix commutata forms dense thickets 20 dm or more in height. Elsewhere the shrub stratum may be open and shorter. The ground is seldom visible beneath the graminoid-dominated herbaceous layer. A typical SACO/CASC community is presented in Figure 13.

Adjacent Communities. SACO/CASC communities may be adjacent to herbaceous bogs dominated by Eleocharis pauciflora or stunted Carex scopulorum (ELPA ct). In some locations a fringe of Vaccinium occidentale (PICO/VAOC ct without Pinus overstory) may separate SACO/CASC communities from bogs. Boundaries are clear to gradual.

SACO/CASC communites usually merge into upland forests characteristic of the ABLA/VASC, ABLA/VACA or ABLA/CAGE hts. Boundaries are clear to distinct.

Production. Production figures, in g/m^2, are based on three sample locations.

Graminoids -	average:	78;	range:	35-154;
Forbs -	average:	15;	range:	10- 21;
Total Herbaceous -	average:	93;	range:	45-175;
Shrubs -	average:	67;	range:	16-143;
Total -	average:	160;	range:	61-318;

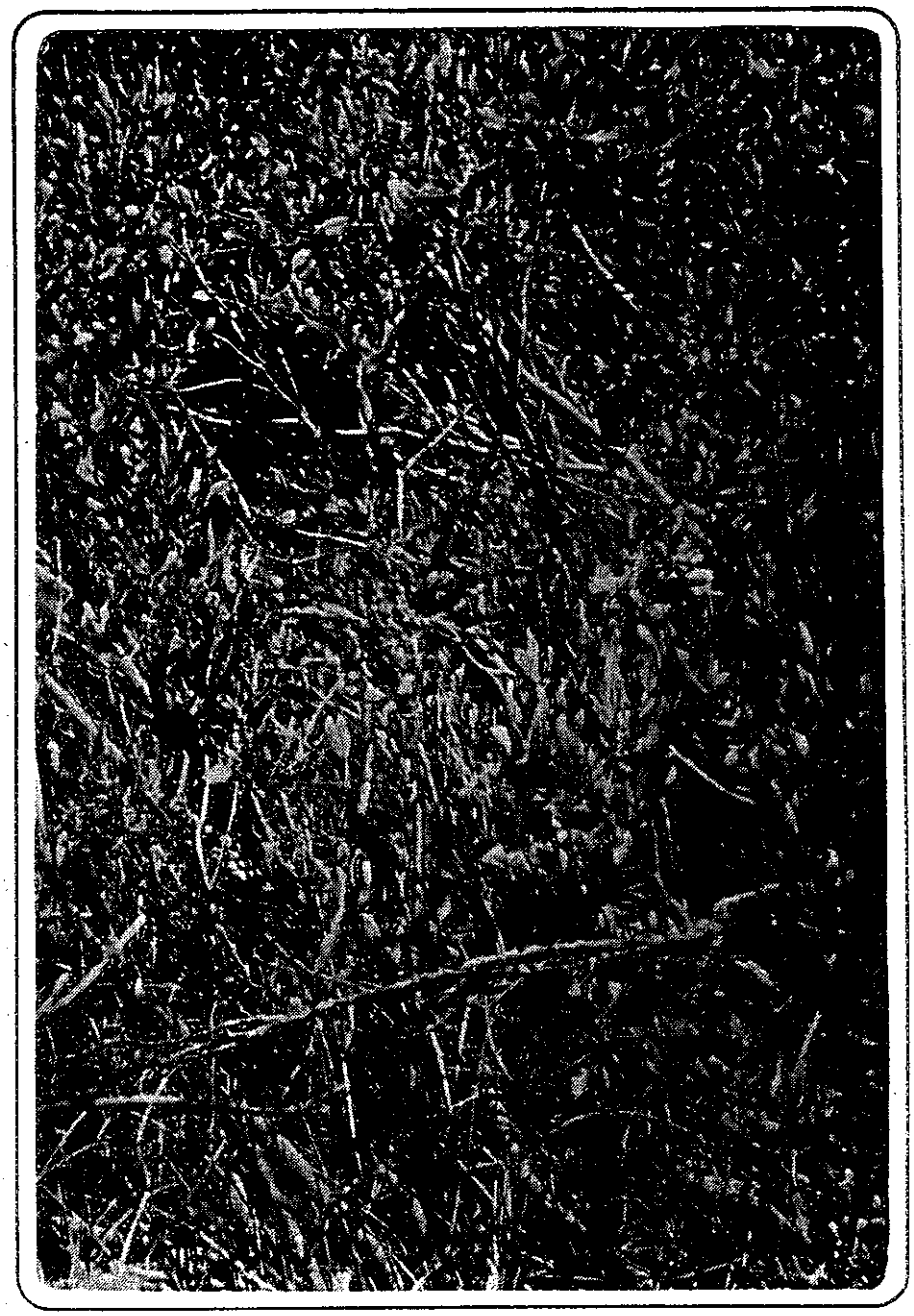

Figure 13. SACO/CASC community.

Environmental Parameters. SACO/CASC communities are mostly confined to narrow riparian zones along upper reaches of steams, or to elongate openings in higher elevation forests. The valley bottom, if such can be defined, may be well over 100 m wide. Sample plot elevations range from 2065-2220 m (6780-7290 ft), in all cases upstream from the wide, flat-bottomed portions of respective drainages. SACO/CASC sites are found near small streams or seeps, occasionally rimming unforested areas that have a central bog or rivulet.

Microtopography is usually somewhat hummocky to undulating. Slopes range from 2-4% or more; higher gradients reflect locations in small upper tributaries.

Soils. These communities are wet to saturated to the surface by flowing groundwater for most or all of the growing season. Available water-holding capacities (AWC) are high, reflecting the preponderance of organic surface horizons. Soils are poorly to very poorly drained. Infiltration rates are rapid with moderate to moderately slow permeability to the gwl. Inherent erodibility is low and no erosion was noted for communities described.

The principal process reflected in soil morphology of these soils is OM proliferation, sometimes interspersed with periods of fine-grained sedimentation and, to a limited extent, OM mineralization. OM may be in the form of bryophytes, graminoid and/or leaf litter, and twigs.

Three taxa were identified: Typic Cryaquent, Terric Borosaprist and Aquic Cryorthent. Profiles are characterized by organic surface horizons 25 cm or more thick subtended by a thin mineral horizon incorporating illuvial mineralized OM. Textures generally become coarser with depth. Particle-size classes are fine to coarse-loamy.

Disturbance and Succession. Disturbance is generally low in SACO/CASC communities. Saturated or near-saturated states inhibit forest encroachment. Communities may remain stable for extended periods under consistent hydrologic parameters.

Management. SACO/CASC communities appear to be a response to "seepy" conditions. Disturbance resulting in channeling of flow or external drainage may result in rapid mineralization of organic horizons and subsequent succession towards more mesic communities. The current conditions function to filter sediments eroding from adjacent uplands, thus buffering the flux of sediments entering stream systems. SACO/CASC communities occupy similar positions and serve functions similar to SAWO/SWPE communities.

Other Classification. SACO/CASC communities are not described in other classifications.

Salix wolfii/Swertia perennis ct
(SAWO/SWPE ct; Wolf's willow/Swertia ct)

Location. SAWO/SWPE communities are scattered at middle to upper elevations through much of the study area. They were not observed covering large continuous areas.

Floristics and Physiognomy. Salix wolfii var. idahoensis has at least 15% coverage, generally much greater. It usually dominates a low shrub stratum (< 15 dm) that include Lonicera caerulea, Potentilla fruticosa, and/or Salix phylicifolia. Vaccinium occidentale is absent.

Rarely, a discontinuous tall-shrub layer of Betula glandulosa is present. All Salix spp. other than S. wolfii and S. phylicifolia total less than 5% coverage. Trees are rarely present, never forming a continuous overstory.

Swertia perennis is present in the herbaceous stratum. Carex aquatilis is usually present and may be dominant. Pedicularis groenlandica has high constancy. Carex dioica and Thalictrum alpinum have low constancy but high fidelity. Moss is prevalent on the surface in many communities.

The low silver-green Salix wolfii is scattered to continuous above a turfy groundcover that feels resilient to the step. Figure 14 pictures a SAWO/SWPE community with the magenta Pedicularis groenlandica conspicuous.

Adjacent Communities. The most frequent adjoining communities are members of the CARO, JUBA, DECE, and SAWO/CAMI cts. Boundaries are mostly clear to gradual.

On slopes above SAWO/SWPE communities are stands characteristic of Abies lasiocarpa or Artemisia vaseyana hts. Boundaries are generally distinct.

Production. Figures, in g/m^2, are based on three sample sites.

Graminoids -	average:	42;	range:	24- 71;
Forbs -	average:	34;	range:	13- 46;
Total Herbaceous -	average:	76;	range:	37-117;
Shrubs -	average:	22;	range:	13- 28;
Total -	average:	98;	range:	50-145;

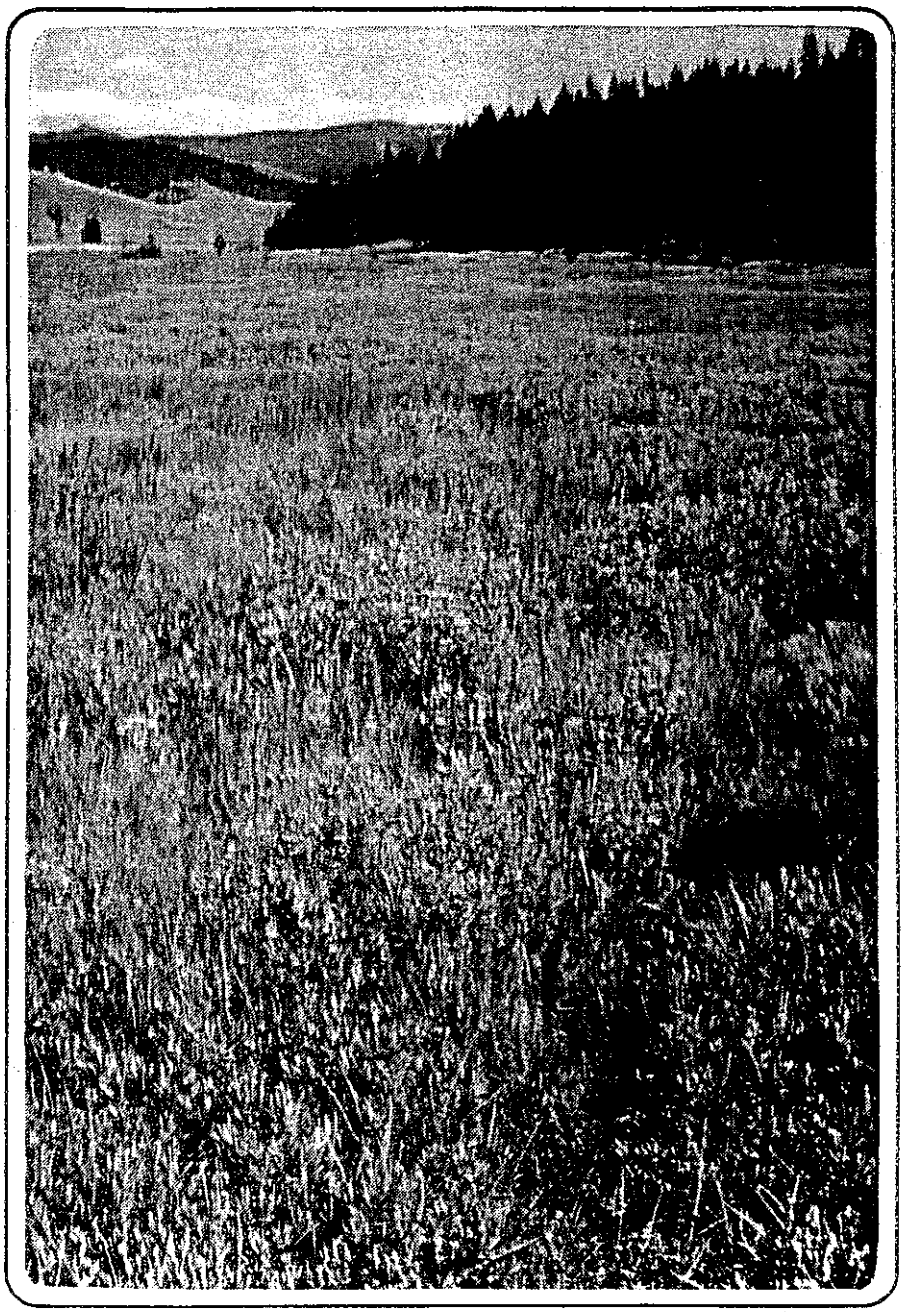

Figure 14. SAWO/SWPE community.

Environmental Parameters. SAWO/SWPE communities are mostly associated with wide valleys. Stands often occur on seepy toeslopes and, less frequently, adjacent to stream channels. Where in cental portions of valleys, SAWO/SWPE communities are commonly elevated above small, marshy depressions; where on toeslopes and terraces, surface drainage is dispersed into small rivulets.

Although these communities are generally in concave positions, organic matter proliferation usually results in slightly convex surfaces. Microtopography in central valley-bottom positions is slightly to moderately hummocky. Elongate undulations corresponding to surface drainage are common on sloping valley-edge positions.

Soils. These communities are wet but not saturated for most or all of the growing season. Groundwater is flowing and is probably better aerated than stagnant valley-bottom groundwater. Soils are generally poorly drained. Available water-holding capacities are high; infiltration and permeability to the gwl are generally moderate to rapid. Inherent erodibility of organic epipedons is low and little erosion was noted.

The principal processes characterizing these soils are OM proliferation and, to a limited extent, subsequent OM mineralization. Fluvial processes are not apparent in the morphology although some colluvial effects were noted. Profiles are characterized by organic surface horizons. Some are subtended by Mollic epipedons or "A" horizons transitional to variably-textured "C" horizons.

Taxa identified are Histosols, Mollisols and Entisols. Histosols are Terric Subgroups of Borohemists and Borosaprists. Mollisols are Typic Cryaquolls and Entisols are generally Typic Cryaquents. An Aquic Cryofluvent was also identified.

Most communities are characterized by a gwl at or below 25 cm and a capillary fringe which extends to the soil surface. Particle-size classes of subsurface mineral horizons range from fine to sandy-skeletal.

Disturbance and Succession. Livestock grazing is the most appreciable disturbance in SAWO/SWPE communities. Cattle reduce graminoid composition and accentuate hummockiness of surfaces.

Sheep may reduce shrub stature and vigor. Extensive areas of Pole Creek Meadow appear referrable to SAWO/SWPE communities based on position, soil inferences and herbaceous species composition. Salix wolfii is sparse and stunted where present. The condition is thought to be the effect of long-term, intensive use by sheep. Downstream from the old Pole Creek Guard Station, where sheep use is less concentrated, SAWO/SWPE communities are vigorous.

SAWO/SWPE communities appear as stable as the drainage configurations they reflect. Where disturbance results in drainage of surface organic horizons or sedimentation from upland sources, more mesic herbaceous communities may develop.

Management. Organic surface horizons of SAWO/SWPE communities filter sediments from upland runoff and buffer the rate which sediments enter stream systems. Intensive grazing may result in the channeling of drainage and subsequent rapid mineralization of surface organic horizons. The potential impact of grazing is probably higher early in the season when runoff is at a maximum. The potential may decrease with the season as root systems develop into a bound, cohesive turf.

Other Classifications. Tuhy (1981) describes a virtually identical SAWO/SWPE ct for the Sawtooth Valley. Norton et al. (1981) recognize a similar type in western Wyoming. Jensen and Tuhy (1981) note similar SWPE understories beneath Salix wolfii and S. phylicifolia on the north slope of the Uinta Mountains, Utah.

Pinus contorta/Vaccinium occidentale ct
(PICO/VAOC ct; lodgepole pine/ western bog blueberry ct)

Location. PICO/VAOC communities are scattered through middle to higher elevations of the study area, mostly in the granitic western portion including the Sawtooth Range.

Floristics and Physiognomy. Vaccinium occidentale has at least 3% coverage, usually much greater. It often dominates a fairly continuous low-shrub statum (< 15 dm), which commonly includes Lonicera caerulea, Potentilla fruticosa, Ledum glandulosum, Salix phylicifolia and/or Salix wolfii. A discontinuous tall-shrub stratum with Betula glandulosa or some Salix spp. may be present. Higher-elevation sites may contain Phyllodoce empetriformis and Cassiope mertensiana.

Pinus contorta regeneration and overstory (live or dead) are often present. However, as a group these are not forested (closed canopy) communities. Abies lasiocarpa regeneration is occasionally present, but is not successfully reproducing.

Calamagrostis canadensis and Swertia perennis are often present in a discontinuous herbaceous stratum. Moss, including Sphagnum spp., is extensive in some communities.

A fairly dense low-shrub layer containing Vaccinium occidentale visually characterizes PICO/VAOC communities. Scattered tall shrubs and/or conifers may be present. A typical community is represented in Figure 15.

Adjacent Communities. Members of the ELPA and CARO cts are most often adjacent to PICO/VAOC communities; boundaries are variable. Adjoining upland forest sites are mostly of the ABLA/VACA or ABLA/VASC hts; boundaries are clear to gradual.

Production. Figures, in g/m^2, are based on three sample sites.

Graminoids -	average:	18;	range:	10-25;
Forbs -	average:	6;	range:	0-10;
Total Herbaceous -	average:	24;	range:	10-35;
Shrubs -	average:	25;	range:	23-27;
Total -	average:	49;	range:	33-62;

Environmental Parameters. PICO/VAOC communities are associated with elongate, wet clearings more than 30 m wide. Often these sites are marginal to or scattered within open bogs. Several PICO/VAOC communities were

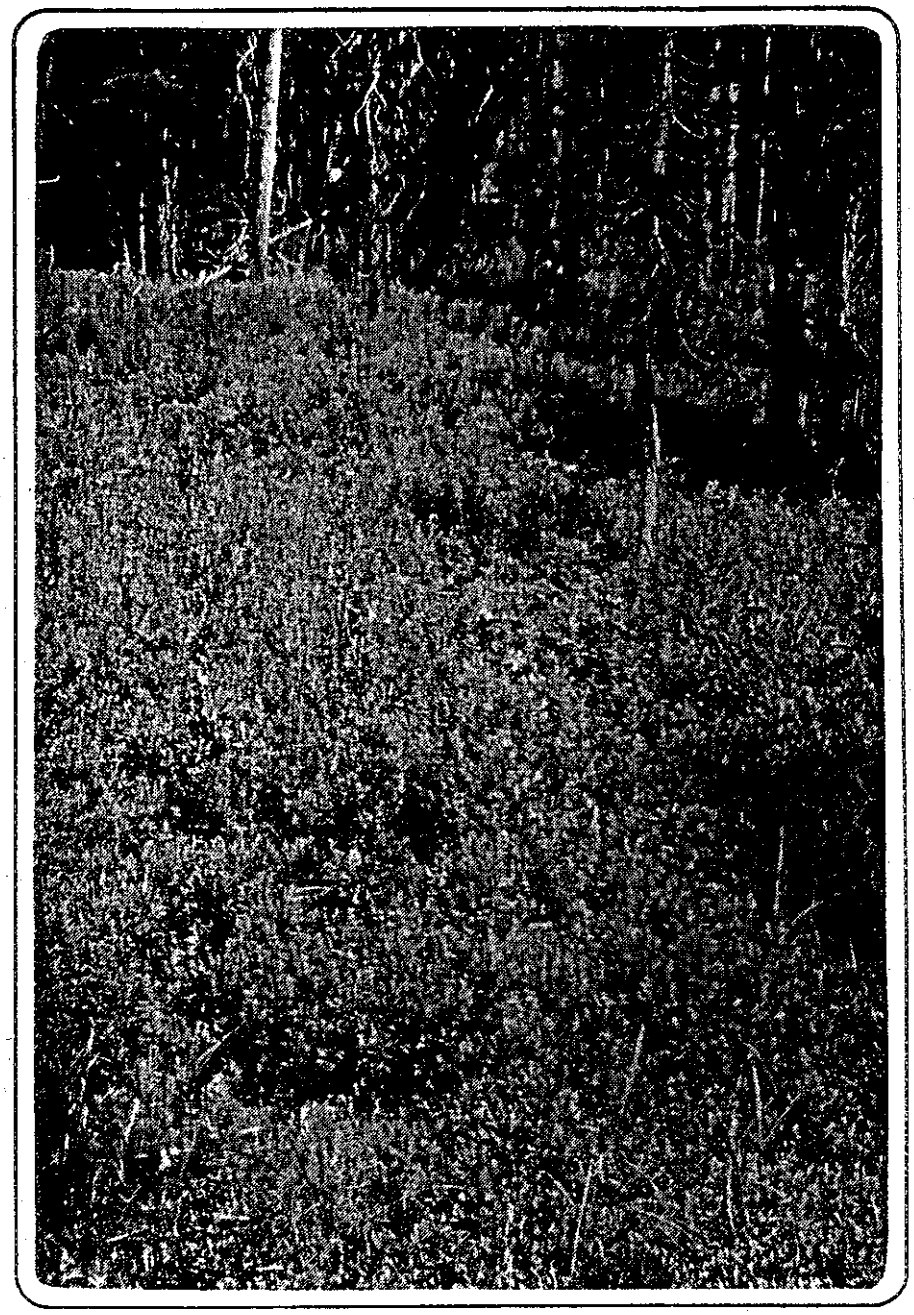

Figure 15. PICO/VAOC community.

observed adjacent to low-gradient streams, elevated 4 dm or more above stream levels.

Greatest areal development occurs in broad valleys where gradient perpendicular to the valley axis is low.

The communities are generally slightly to moderately convex with slightly to moderately hummocky microtopography. Slopes range from 0-7%.

Soils. These communities exhibit a broad range in hydrologic and morphologic characteristics. Surfaces may be wet or dry. Soils are somewhat poorly to very poorly drained with moderate to high AWC. Infiltration is moderate to rapid with slow to moderately rapid permeability to the gwl. Inherent erodibility is generally low and little erosion was observed.

Processes inherent to PICO/VAOC communities are those predictable for riparian systems in addition to those normally restricted to upland positions. Processes include: OM proliferation, OM mineralization, eluviation and illuviation of clay and mineralized OM, alteration of subsurface horizons by removal of soluble bases and oxidation/reduction reactions, and sedimentation of sandy to fine-loamy material.

Distinctly segregated horizons indicative of fluventic deposition are generally buried beneath relatively thick layers characterized by long term in-situ pedogenesis. Fluventic episodes apparently precede changes in floodplain morphology which result in the formation of bogs often flanked by PICO/VAOC communities. As bogs develop, vertical accretion of OM results in expansion of the state to edges of upland communities. PICO/VAOC communities have properties characteristic of both upland forest communites and the wettest riparian communities. It is not surprising that these communities are often restricted to narrow transitions between bogs and uplands, given the extreme range of states they bridge.

Taxa identified include a Typic Cryaquent, Terric and Fluvaquentic Subgroups of Histosols, Aquic Subgroups of Cryofluvents, Cryorthents, Cryoboralfs, Cryoborolls, and a Typic Cryochrept. Particle-size classes range from fine-loamy to sandy-skeletal. Subsurface horizons of fluventic character often incorporate significant volumes of coarse fragments.

Disturbance and Succession. PICO/VAOC communities appear resistant to minor disturbance. Reduced shrub vigor and accentuated hummockiness were observed in some sites accessible to livestock.

Formation of these communities may be retrogressive from upland forest hts or from more mesic riparian cts in response to the expansion of adjacent bogs. Dead Pinus contorta individuals and regeneration were observed in PICO/VAOC communities and within bog margins. Drier PICO/VAOC

communities include successfully reproducing Pinus. The expansion of bogs may fragment a formerly continuous PICO/VAOC community into isolated patches.

Drainage of adjacent bogs would probably result in succession of PICO/VAOC communities toward drier forest habitats or more mesic riparian communities.

Management. PICO/VAOC communities moderate the flux of sediments entering fluvial systems from upland landforms. Management of these communities may be primarily directed toward preservation of conditions inherent to adjacent bog communities, from which current processes of PICO/VAOC communities are derived.

Other Classifications. Tuhy (1981) describes a virtually identical PICO/VAOC ct in the Sawtooth Valley. Dominance of Vaccinium occidentale separates this unit from related wet habitat types of the Abies lasiocarpa series, such as the ABLA/LEGL ht (Steele et al., 1979b).

Juncus balticus ct
(JUBA ct; Baltic rush ct)

Location. JUBA communities occur mostly in and around the wide valleys at middle elevations of the study area. They seldom cover large continuous areas.

Floristics and Physiognomy. Juncus balticus has at least 25% coverage, usually much greater. Deschampsia cespitosa may be present in substantial amounts, but with less coverage than the Juncus. Muhlenbergia filiformis, Carex aquatilis and Carex simulata are common associates.

Eleocharis pauciflora or Poa pratensis may be present with less than 5% coverage. Total shrub coverage is less than 15%; trees are absent.

JUBA communities are herbaceous areas visually dominated by the dark green Juncus. The stems, with apparently lateral inflorescences, are mostly 3-7 dm tall. Associated species are roughly equal in height, or are smaller and not visible from a distance. The ground surface typically feels cushioned. A JUBA community is pictured in Figure 16.

Adjacent Communities. Communities of the DECE, POPR, SAWO/SWPE and CARO cts most often adjoin JUBA sites. Boundaries are generally clear, though boundaries between JUBA and DECE communities may be diffuse. These adjacent types share some floristic and environmental features with the JUBA ct; all may occur as mosaics in large meadows.

Production. Figures, in g/m^2, are based on three sample locations.

Graminoids -	average:	147;	range:	125-180;
Forbs -	average:	30;	range:	24- 37;
Total Herbaceous -	average:	177;	range:	149-217;

Environmental Parameters. JUBA communities occur in wide valleys. They occupy toeslopes, terraces or central portions of broad valley bottoms, positions which may have perched water tables or be discharge areas for groundwater from adjacent uplands. These communities rarely occur near large streams. JUBA communities seem transitional to more mesic riparian community types.

Surfaces of JUBA communities range from convex to concave with smooth to slightly hummocky microtopography. Drainage rills and channels are uncommon. Slopes are generally 3-5% and aspects are commonly perpendicular to the valley axis; as reflective of valley-edge positions.

Figure 16. JUBA community.

Soils. Generally, these communities are wet to saturated at the surface for only short periods of the growing season. Soils have moderate AWC above the gwl and most are moderately well drained although the range is from very poorly to moderately well drained. Infiltration is rapid and permeability to the gwl is moderate to slow. Inherent erodibility is low and little or no erosion was noted.

These communities are characterized by gwls which fluctuate from the surface to below 50 cm. Dominant processes are OM proliferation and concurrent mineralization. Limited illuviation of mineralized OM occurs.

Taxa include Aquic and Typic Cryorthents, a Typic Cryaquoll and an Aquic Cryoboroll. An Aquic Cryofluvent was also described, although this is not characteristic of the type.

A typical pedon has a thin, organic surface horizon subtended by a fine-loamy or finer horizon with mineralized OM accumulation ("A" horizon). The extent of OM accumulation is often definitive of a Mollic epipedon.

Disturbance and Succession. Little or no disturbance was observed in JUBA communities. Some trampling by livestock was noted where adjacent communities were heavily grazed.

Characteristics of JUBA communities are transitional between wetter understory types (CARU, SWPE) and more mesic understory types (DECE, POPR). Regression to wetter communities or succession to more mesic communitiesmay result from several factors. These include subtle variation in drainage from upland sources, changes in valley gwls, accretion of OM from adjacent communities, mineralization of organic surface horizons, sedimentation and channel erosion. Some communities may be colonized by shrubs, most likely Salix wolfii, but this tendency was seldom observed.

Management. Surfaces of JUBA communities are resistant to the effects of light to moderate livestock trampling, and are resilient following such disturbance. Cattle and sheep often leave the Juncus virtually uneaten in favor of more palatable species growing in adjacent areas.

Surfaces may be more susceptible to cutting and erosion when wet. If erosional impacts are incurred before or during heavy runoff periods , surface organic horizons may be channelled and drained before vegetation is fully developed. Such a situation may cause mineralization of surface organic horizons and succession to drier communities.

Other Classifications. The Juncus balticus-Muhlenbergia filiformis ct described by Tuhy (1981) is included in the broader JUBA ct. Padgett (1981) describes a similar JUBA ct in eastern Oregon.

Salix drummondiana/Calamagrostis canadensis ct.
(SADR/CACA ct; Drummond willow/bluejoint reedgrass ct)

Location. SADR/CACA communities are widely distributed throughout the study area except for the lowest eastern canyon sections. These are among the more commonly encountered riparian communities, but are seldom large.

Floristics and Physiognomy. Shrubs taller than 15 dm have at least 15% coverage, usually much greater. Salix drummondiana is most often dominant. Salix myrtillifolia is often present; on some sites it is the dominant (or only) tall shrub. Salix monticola may dominate along small, high gradient streams. Lesser amounts of tall Salix wolfii, Salix commutata and/or Betula glandulosa may be mingled in this stratum. Alnus incana and Salix geyeriana are usually absent.

A discontinuous low-shrub stratum is often present, featuring Lonicera involucrata and/or Ribes lacustre.

In the herbaceous stratum Calamagrostis canadensis has at least 5% coverage, usually much greater, and is often dominant. Other moist-site herbs with high constancy include Bromus ciliatus, Aconitum columbianum, Geum macrophyllum, Polemonium occidentale, Senecio triangularis and Thalictrum occidentale.

Carex rostata and Carex aquatilis are seldom present, never with more than 30% coverage. Mitella pentandra and Saxifraga arguta occur along steep, mossy stream banks. Trees are uncommon; individual mature trees or sparse regeneration is sometimes present.

The tall-shrub stratum is often continuous and dense, but may be interrupted by narrow corridors. The low shrubs usually grow within stem chlums of the taller shrubs. Graminoid-dominated ground vegetation is often dense and contains a appreciable forb complement. A SADR/CACA community is illustrated in Figure 17.

Adjacent Communities. SADR/CACA is often the sole riparian community in narrow bottoms. Elsewhere, communities of the AGSC-bar and ALIN-COST cts adjoin; boundaries are distinct and clear to gradual, respectively. Climax stands of the ABLA/CACA ht may also be adjacent with various boundaries. SADR/CACA sites may be bordered by upland hts of the ABLA series, with understories characterized by Carex geyeri, Calamagrostis rubescens, or Vaccinium scoparium.

Figure 17. SADR/CACA community.

Production. Figures, in g/m^2, are based on three sample sites.

Graminoids -	average:	80;	range:	7-129;
Forbs -	average:	30;	range:	14- 59;
Total Herbaceous -	average:	110;	range:	21-188;
Shrubs -	average:	54;	range:	44- 71;
Total -	average:	164;	range:	65-259;

Environmental Parameters. SADR/CACA communities occur in valleys of all widths and shapes. Stands dominated by Salix monticola occur adjacent to small, high-gradient streams in narrow bottoms. Other more typic communities are associated with wider valleys.

SADR/CACA communities are usually adjacent to streams and 3-10 dm above water levels. Some are narrow fringes; others are continuous to 30 m away. Other SADR/CACA communities occur near streams but are separated by a different community adjoining the channel. SADR/CACA sites were also observed in concave valley-edge positions and on convex fans at the base of upland draws. Communities were not observed centrally located between streams and sideslopes of large, middle-elevation valley bottoms.

Communities were observed from 1855 m (6090 ft) to over 2500 m (8200 ft) elevation. Positions are convex, even or concave with slightly to moderately hummocky microtopography. Some sites are somewhat undulating, with the long axis parallel to stream flow. Slopes range from 1-6%; higher gradients are indicative of toeslopes or upper-elevation streams. Salix monticola-dominated overstories may have gradients of up to 50%.

Soils. These communities are typically moist at the soil surface although some are wet to saturated. Soils are somewhat poorly to poorly drained with low to high AWC above the gwl. Infiltration is moderate with moderate to rapid permeability to the gwl. Inherent erodibility is low to moderate and erosion ranges from moderate to low for communities described.

These soils are characteristically fluventic in nature. Concurrent OM proliferation and mineralization is most common although OM proliferation dominates in some communities. Advanced in-situ pedogenesis may dominate positions elevated above the normal level affected by fluventic processes.

Most taxa identified are Aquic Cryofluvents. Aquic Cryoborolls are also common. A Terric Borohemist, Histic Cryaquoll and Typic Cryofluvent were also described. Particle-size classes range from coarse-loamy to fragmental. Texture generally becomes coarser with depth.

A typical profile has a thin layer of graminoid and leaf litter and a mineral horizon with OM content definitive of, or approaching that of a

Mollic epipedon. Epipedons are commonly subtended by horizons transitional to underlying "C" horizons. Lithologic discontinuities are common. Subsurface horizons commonly incorporate significant volumes of rounded gravel and cobbles.

Disturbance and Succession. Livestock penetrate some SADR/CACA stands, widening intershrub corridors and accentuating hummockiness of the surface. Beavers utilize the shrubs on some sites for food and dam materials. Communities may be periodically affected by erosional and depositional processes of high-energy flood events. SADR/CACA communities form in positions where vertical accretion of sandy or finer-grained material has built up surfaces to just above normal flood-levels. Continued fluventic sedimentation may result in successsion to somewhat more mesic SAGE/CACA communities. Abundance of Calamagrostis canadensis suggests that communities may be seral stages of the ABLA/CACA ht. The development of a conifer overstory tends to reduce and eventually eliminate the shade-intolerant Salix spp. without affecting the herbaceous layer.

Erosional forces may reduce streamside soils to the gravelly substratum upon which communities rest. Contrarily, fine-grained sedimentation and OM proliferation may result from beaver activity in adjacent positions. In this case, regression to SALIX/CARO or CARO communities seems most likely.

Management. SADR/CACA communities control the immediate flux of sediments entering stream systems. Where adjacent to streams, the transition to the aquatic system is often an abrupt, steep bank. Stream banks are susceptible to undercutting and lateral erosional forces, especially at the interfaces of horizons of contrasting textural classes. Healthy Salix spp. reduce bank sloughing, even under moderate loads. Sloughing was most frequently observed along frequently-used wildlife and livestock trails. The vigor of Salix spp. in these communities appears directly related to streambank stability and rate of sedimentation into stream systems.

Other Classifications. Tuhy (1981) describess a Salix drummondiana/Ribes lacustre/Thalictrum occidentale ct in the Sawtooth Valley which is similar to the SADR/CACA ct. Schlatterer (1972) recognizes an ABLA/CACA type which may include "elements of adjacent meadow communities such as willows and sedges". Jensen and Tuhy (1981) note communities dominated by Calamagrostis canadensis beneath Salix phylicifolia and S. geyeriana on the north slope of the Uinta Mountains, Utah; S. drummondiana and S. myrtillifolia are much less common than in central Idaho.

Salix geyeriana/Calamagrostis canadensis ct
(SAGE/CACA ct; Geyer willow/bluejoint reedgrass ct)

Location. SAGE/CACA communities are found at lower and middle elevations through much of the study area except in the western portions and the lowest canyons.

Floristics and Physiognomy. Salix geyeriana is the dominant tall shrub (> 15 dm) with at least 15% coverage, generally much greater. Betula glandulosa may be present and is sometimes codominant. Other Salix spp. are rarely present, never with more than 15% total coverage. Lonicera caerulea and/or Ribes lacustre may form a discontinuous low-shrub layer (< 15 dm tall).

The SAGE/CACA ct essentially groups communities with a Salix geyeriana overstory; understories are more variable. Calamagorstis canadensis is usually dominant, but is absent from some stands. Other species with high constancy but lesser coverage include Bromus ciliatus, Poa pratensis, Geum macrophyllum and Senecio pseudaureus.

Carex rostrata and Carex aquatilis lack 30% total canopy coverage, if present. Vaccinium occidentale and trees are absent.

The tall-shrub stratum may be continuous and dense, with narrow intershrub corridors. Alternately, the shrubs may form distinct clumps several meters in diameter, surrounded by herbaceous openings. Low shrubs and high-constancy forbs usually grow within clumps of the tall shrubs. A typical SAGE/CACA stand is pictured in Figure 18.

Adjacent Communities. Stands of the SAWO/CAMI, DECE and POPR cts commonly border SAGE/CACA communities. Boundaries are mostly clear to gradual. CARO and SALIX/CARO communities commonly adjoin SAGE/CACA communites where beavers are active.

Upland units which adjoin SAGE/CACA sites are commonly dominated by Artemisia vaseyana or Pinus contorta. Boundaries are clear to distinct.

Production. Figures, in g/m^2, are based on three sample plots.

Graminoids -	average:	70;	range:	10-120;
Forbs -	average:	20;	range:	10- 40;
Total Herbaceous -	average:	90;	range:	20-160;
Shrubs -	average:	50;	range:	22- 89;
Total -	average:	140;	range:	44-249;

Figure 18. SAGE/CACA community.

Environmental Parameters. SAGE/CACA communities are most common in wide valleys. Some stands occupy valley-edge positions adjacent to upland slopes. Other SAGE/CACA stands occur near streams in the centers of flat valleys, either adjacent to or separated from the channel by another community.

Most positions are even or slightly convex; microtopography is mostly hummocky, corresponding with shrub bases. Some sites are dissected by undulations or drainage rills, generally parallel to stream flow. Slopes range from 1-4%, with higher gradients corresponding to positions at the edge of riparian zones.

Soils. Depths to gwl and to the top of the capillary fringe are significantly greater for SAGE/CACA than for SADR/CACA communities. Soils are moderately well to somewhat poorly drained with moderate to low AWC. Infiltration is moderate to moderately rapid with moderately rapid to slow permeability to the gwl. Inherent erodibility is moderate to low while erosion of surface horizons varies from slight to moderate.

These soils are fluventic in nature. Profiles often are comprised of two or more lithologic discontinuities resulting from distinct depositional events. The present state of the systems appear to be dominated by in-situ processes of pedogenesis: concurrent proliferation, mineralization and redistribution of OM, and alteration of subsurface horizons.

Soil taxa identified are Mollic and Aquic Cryofluvents, a Typic Cryaquent; Aquic, Typic and Cumulic Cryoborolls; and a Typic Cryochrept.

Epipedons are generally loamy and meet Mollic criteria except for thickness in some cases. One thin (7 cm) organic epipedon was described. Horizons subtending the epipedon are transitional from "A" to "C" horizons, or indicative of a lithologic discontinuity. Deeper horizons may incorporate significant volumes of rounded, coarse fragments.

Disturbance and Succession. Grazing and beaver activity are the most appreciable disturbances observed in SAGE/CACA stands. Livestock will enlarge intershrub corridors and accentuate surface unevenness. Dead tops and outer branches of the shrubs, as well as "umbrella" form, are attributable to grazing by livestock and/or wildlife. Beavers utilize shrub branches for food and dam materials.

SAGE/CACA communities appear to result from progression of processes described with respect to SADR/CACA communities. Surface horizons incorporating mineralized OM are significantly thicker and gwls are significantly deeper than SADR/CACA communities. Further succession of SAGE/CACA communities may be toward ABLA/CACA stands in narrow valleys, or toward drier riparian communities in broad systems.

Beaver activity may result in retrogression of SAGE/CACA sites to SALIX/CARO or CARO communities, though this is more likely to happen in SADR/CACA communities.

Management. The growth form and quantity of dead branches on Salix spp. may serve as gauges of grazing pressure. Management criteria for SAGE/CACA communities are essentially identical to those described for SADR/CACA. Where adjacent to channels, the somewhat higher banks of SAGE/CACA communities are more susceptible to sloughing under moderate loads.

Other Classifications. Tuhy (1981) describes a similar SAGE/Geum macrophyllum ct for the Sawtooth Valley; Calamagrostis canadensis seems a better label because it is more conspicuous in the understory. Norton et al. (1981) note that Salix geyeriana is absent from riparian zones of the Greys River basin, Wyoming, but the species was noted along the upper Hoback and Green Rivers. Jensen and Tuhy (1981) recognize a tentative SAGE/CACA ct on the north slope of the Uinta Mountains, Utah. The SAGE stream type and drier portion of the SAGE meadow type defined in eastern Oregon by Padgett (1981) are roughly similar to the broader SAGE/CACA ct.

Salix wolfii/Carex microptera ct
(SAWO/CAMI ct; Wolf's willow/small-winged sedge ct)

Location. SAWO/CAMI communities occur in the western and northern segments of the study area at moderate elevations. They were not observed in the Sawtooth Valley or White Cloud areas. Stands are small and scattered.

Floristics and Physiognomy. Salix wolfii var. idahoensis with at least 15% coverage, usually greater, dominates a low shrub stratum (< 15 dm). Lonicera caerulea is commonly present. Other Salix spp., Betula glandulosa and trees are absent.

Herbaceous strata are fairly diverse among sites of this community type. Swertia perennis, Carex aquatilis and other herbaceous species characteristic of the wetter SAWO/SWPE and SALIX/CARO cts are absent. Unlike many species of Carex, C. microptera indicates somewhat drier sites. This species lacks 100% constancy and is seldom dominant, yet is generally absent from the SAWO/SWPE ct. A species of Penstemon is often present in the basal leaf stage; this is probably P. globosus, though P. attenuatus also grows in the study area. Other herbs with moderate constancy and fidelity include Achillea millefolium, Deschampsia cespitosa, Stellaria longipes and Trisetum wolfii.

The low silver-green Salix wolfii is scattered to continuous above a mix of mesic forbs and graminoids. A typical SAWO/CAMI community is shown in Figure 19.

Adjacent Communities. Members of the CARO, SALIX/CARO and SAWO/SWPE cts commonly adjoin SAWO/CAMI communities in wetter positions. Boundaries are clear to gradual. DECE and/or SAGE/CACA communities may join SAWO/CAMI sites in mosaics. Drier ASIN-FEID, Artemisia vaseyana or Pinus contorta stands may be adjacent on upland edges of SAWO/CAMI communities; boundaries are mostly clear.

Production. The SAWO/CAMI ct was delineated following completion of field work, so no production data were collected. Shrub-leaf production is likely similar to that of the SAWO/SWPE ct; forb and graminoid production is probably less.

Environmental Parameters. SAWO/CAMI communities occur in relatively wide valleys. Positions range from 6-10 dm above adjacent streams, to gently-sloping valley edges. Whole bottoms of small valleys may be occupied.

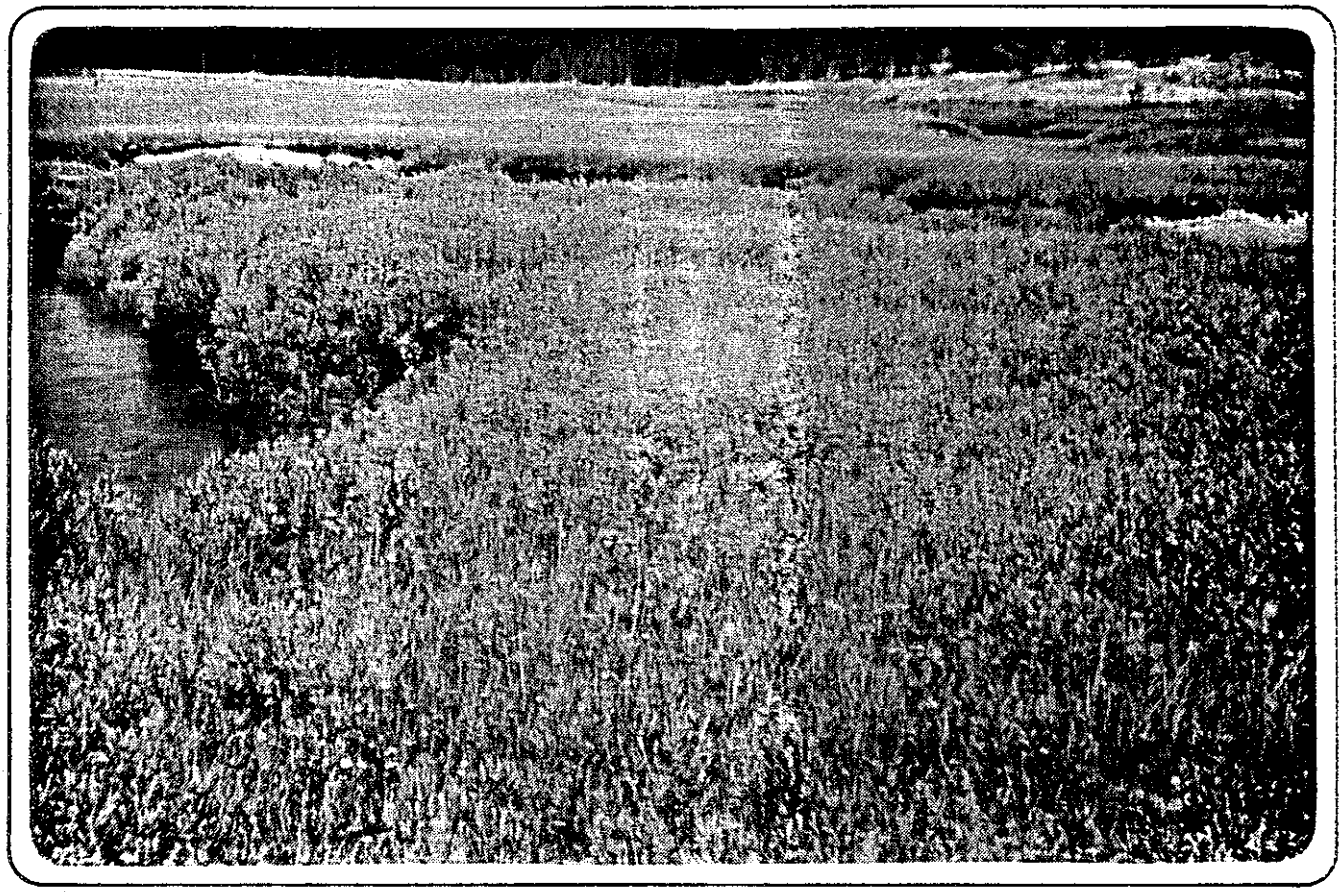

Figure 19. SAWO/CAMI community.

Most SAWO/CAMI sites are slightly concave, as opposed to SAWO/SWPE sites which are mostly convex. Microtopography ranges from smooth to moderately hummocky. Slopes vary from 2-5%.

Soils. These communities are mesic (moderate) with respect to hydrologic parameters. Soils are somewhat poorly drained with moderate AWC. Infiltration, permeability to the gwl, and inherent erodibility are moderate. No significant erosion was observed except for shallow drainage rills in some communities.

The principal processes dominating these soils are concurrent OM proliferation, mineralization and redistribution in surface horizons. Fluventic deposition is apparent in most profiles while others are more characterized by orthentic development. All pedons reflect a degree of in-situ pedogenesis including thick surface horizons; one pedon has an argillic horizon.

Aquic, Pachic and Argiaquic Subgroups of Cryoborolls were identified. Particle-size classes range from fine-loamy to sandy-skeletal.

A typical profile has a loamy surface horizon with color and thickness criteria of Mollic character. Lithologic discontinuities (abrupt changes in texture, coarse-fragment composition and/or OM content) are common in lower horizons. Discontinuities reflect layers of sedimentation from distinct fluventic episodes.

Disturbance and Succession. Livestock grazing was observed in some SAWO/CAMI communities, but few sites showed more than low levels of disturbance. Rodent activity was also observed. Where adjacent to streams, banks are susceptible to undercutting and the forces of fluventic erosion. Bank sloughing was noted under moderate grazing pressure.

These communities appear to be transitional to drier herbaceous community types. Hydrologic and soil parameters of SAWO/CAMI communities are nearly identical to those of DECE communities.

Although characteristics of SAWO/CAMI communites are markedly dissimilar to those of the SAWO/SWPE ct, these communities may stem from a common successional path. SAWO/SWPE soils have thick organic surface-horizons. If surface horizons were drained due to changes in hydrology, these organic epipedons would rapidly mineralize. The thick mollic epipedons of SAWO/CAMI communities may incorporate residues originating in surface organic horizons of SAWO/SWPE communites. Alternatively SAWO/CAMI communites may result from regression from drier communities toward more mesic states. Mollic epipedons significantly thicker than those of drier communities are difficult to explain given this alternative explanation. In either case, Salix wolfii seems rather disjunct from its

preferred habitat.

Management. These communities are more sensitive indicators of grazing pressure than wetter SAWO communities. Surface horizons are moderately erodible. Reduction in the density and/or vigor of the herbaceous stratum may result in channeling of upland runoff, erosion of surface horizons and increased sediment flux into stream systems. Although Salix wolfii is somewhat of a deterrent, banks are susceptible to sloughing under moderate to heavy loads where communities adjoin streams.

Other Classifications. A few communities included in the SAWO/SWPE ct of Tuhy (1981) might be better referred to the SAWO/CAMI ct, but too few recur in the Sawtooth Valley to recognize a separate type for the area. Norton et al. (1981) describe a similar drier subset of SAWO sites in western Wyoming, the SAWO/POPR ct, in which Carex microptera has high constancy along with Poa pratensis. Jensen and Tuhy (1981) recognize an unnamed "mesic" subset of SAWO communities on the north slope of the Uinta Mountains, Utah.

Deschampsia cespitosa ct
(DECE ct; tufted hairgrass ct)

Location. DECE communities are found primarily in broad middle elevation valleys, and constitute extensive areas along Valley, Marsh, and Bear Valley Creeks. These communities are scattered elsewhere, but are seldom observed in or around the Sawtooth Valley or in the eastern portion of the area.

Floristics and Physiognomy. Deschampsia cespitosa has at least 10% coverage, often much greater, and is usually dominant or codominant. DECE communities range from rich herbaceous mixtures to sites with little more than the Deschampsia. Common associates include Castilleja cusickii, Luzula campestris, Phleum alpinum and Ranunculus alismaefolius.

Eleocharis pauciflora or Juncus balticus may be present, though with less coverage than Deschampsia. Where present, Poa pratensis does not exceed 5% coverage. Shrub coverage totals less than 15%; trees are absent. These are generally low herbaceous communities. The basal clumps and/or inflorescences of Deschampsia cespitosa are usually conspicuous. Typical appearance of a DECE community is illustrated in Figure 20.

Adjacent Communities. Members of the CARO, ELPA, JUBA, and SAWO/SWPE cts most often adjoin DECE communites. Boundaries are various, mostly clear to gradual. These communities may be arranged as mosaics in large meadows. Drier ASIN-FEID or Artemisia vaseyana communities may also be adjacent, with clear to gradual boundaries.

Production. Figures, in g/m^2, are based on three sample sites.

Graminoids -	average:	46;	range:	34- 57;
Forbs -	average:	47;	range:	23- 73;
Total Herbaceous -	average:	93;	range:	57-130;

Environmental Parameters. DECE communities occupy central positions of broad valleys and somewhat narrower high basins. They rarely occur adjacent to sideslopes or active stream channels. Where adjacent to streams, communities are elevated 5 dm or more above the stream level.

Surfaces are generally even and smooth. DECE communities were observed from 1945 m (6380 ft) to above 2750 m (> 9000 ft); slopes range from 0-3%.

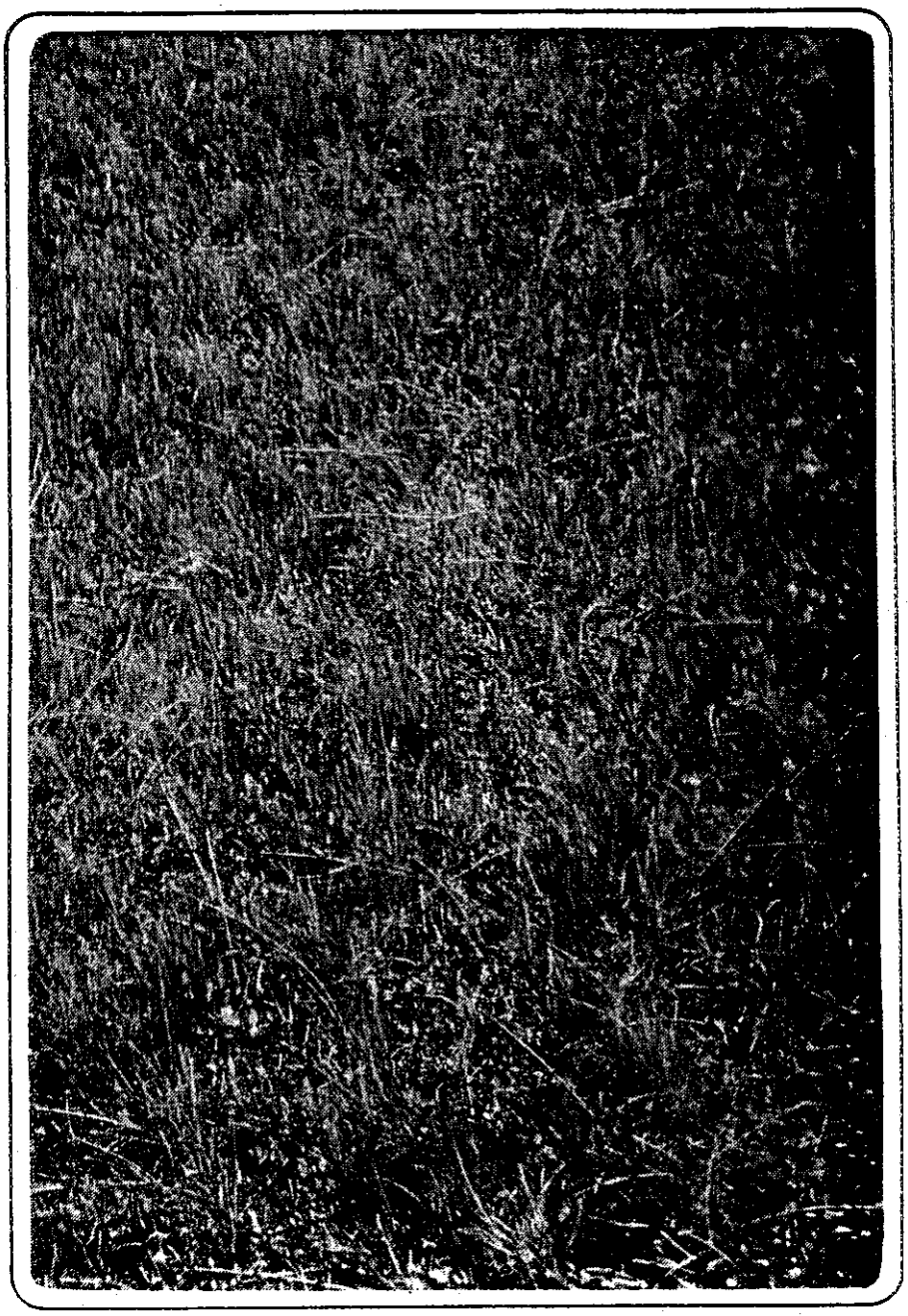

Figure 20. DECE community.

Soils. These communities are moist but not wet at the surface for part (but generally not all) of the growing season. Soils are somewhat poorly to moderately well drained with moderate AWC above the gwl. Infiltration rates are moderate to moderately slow while permeability to the gwl is slow to moderately rapid. Inherent erodibility of surface horizons is moderate and erosion ranges from slight to moderate.

These soils are characterized by in-situ pedogenesis inherent to relatively stable systems. OM originating from grass and forbs is mineralized at a rate approximately equal to that at which it is produced. Subsurface horizons are reflective of fluventic depositon while surface horizons exhibit in-situ development.

Soils are Aquic or Typic Subgroups of Cryoborolls. Profiles have a Mollic epipedon subtended by coarse-loamy mineral horizons, some of which incorporate significant volumes of rounded, coarse fragments. Ground water levels (gwls) are generally at or below 75 cm.

Disturbance and Succession. Grazing is the greatest potential disturbance to DECE communities. Plants of moderately disturbed sites are low in vigor and stature. DECE communities are rarely adjacent to streams; in these anomalous instances, soils are highly susceptible to fluventic erosion and sloughing.

Buried horizons of DECE soils are similar to surface horizons described for SADR/CACA and SAGE/CACA cts and, less frequently, to those described for CARU and SWPE understories. Surface horizons of these soils may to some extent be derived of sediments from adjacent uplands rather than sediments from upstream sources.

Hydrologic and soil characteristics of DECE communities are very similar to those of POPR communities. Mollic epipedons are somewhat better developed (thicker) in DECE communities. Poa pratensis may outcompete Deschampsia under continuous grazing systems, resulting in change to POPR communities. Padgett (1981) reports this change in eastern Oregon riparian zones.

Management. Livestock generally prefer DECE communities to wetter types. DECE communities are more sensitive indicators of grazing pressure.

Surface soils are moderately erodible and susceptible to compaction when wet. Reduction in infiltration may result in channel or sheet erosion of surface soils. The scheduling and intensity of grazing in DECE communities may affect sediment loads entering stream systems.

Where DECE communities are adjacent to streams, banks are highly susceptible to undercutting and sloughing under light to moderate loads,

especially when wet.

Other Classifications. Schlatterer (1972) first described DECE communities in cental Idaho. Tuhy (1981) lists DECE communities under a miscellaneous category because too few recur in and around the Sawtooth Valley to name a DECE ct there. Jensen and Tuhy (1981) note a similar DECE ct on the north slope of the Uinta Mountains, Utah. Lewis (1970) describes several Deschampsia-dominated meadow types in alpine areas of the Uinta Mountains. Mueggler and Stewart (1978) recognize a similar DECE/CAREX type in western Montana. Hall (1973) in eastern Oregon and Volland (1976) in central Oregon both describe meadows dominated by Deschampsia cespitosa.

Poa pratensis ct
(POPR ct; Kentucky bluegrass ct)

Location. POPR communities are located primarily in the eastern and southern parts of the study area. Only in Pole Creek Meadow do they constitute large, continuous areas.

Floristics and Physiognomy. Poa pratensis has at least 5% coverage, usually much greater, and is often dominant or codominant. Common associates include Agropyron caninum, Carex microptera, Achillea millefolium and Stellaria longipes.

Juncus balticus may be present with appreciable coverage, though less than the Poa. Deschampsia cespitosa is absent, or rarely present with trace coverage. Drier-site species such as Festuca idahoensis, Bromus carinatus, Stipa occidentalis var. minor and Aster integrifolius are absent.

A sod-like groundcover of Poa pratensis and associated mesic herbs characterizes these communities. Figure 21 illustrates the POPR ct.

Adjacent Communities. CARU, SAMY/POPR, and ASIN-FEID communities commonly adjoin POPR sites. Boundaries are mostly clear to gradual, though diffuse boundaries were observed with SAMY/POPR communities which have similar understories. The most distinct boundaries are those with the dry meadow ASIN-FEID communities.

Other shrub-dominated communities such as POFR/DAIN, SAGE/CACA, SAWO/SWPE or SALIX/CARU may also be adjacent to POPR sites.

Production. Figures, in g/m^2, are based on two sampling locations; several attempts to sample a third failed because livestock had arrived before the sampling crew.

Graminoids -	average:	62;	range:	28- 97;
Forbs -	average:	41;	range:	15- 67;
Total Herbaceous -	average:	103;	range:	43-164;

Environmental Parameters. POPR communities are found in relatively wide valleys. Position in the valley bottom is usually central, sometimes adjacent to streams though seldom approaching sideslopes. Where adjoining streams, POPR communities are elevated 5 dm or more above the stream surface. POPR sites were also observed near upper dry ends of old beaver ponds.

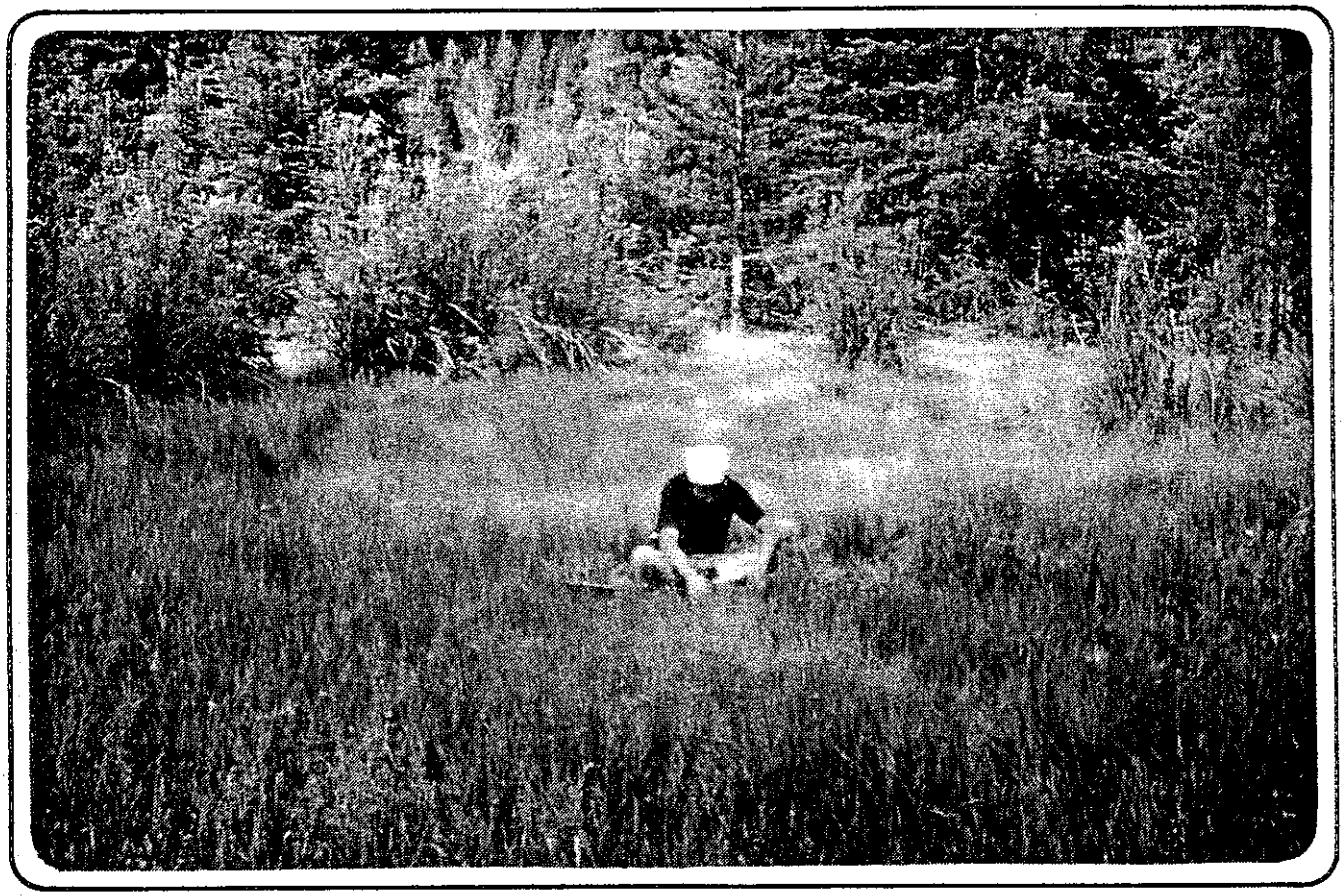

Figure 21. POPR community.

Surfaces are generally smooth and even; some sites are slightly hummocky or undulating. Drainage rills or channels seldom dissect POPR communities. Slopes generally range from 1-3%, reflecting central positions in valleys, though gradients up to 9% were observed along small streams.

Soils. Surface horizons of these soils are generally dry or slightly moist for most of the growing season. Soils are somewhat poorly to moderately well drained with moderate to low AWC above the gwl. Infiltration rates are moderate to moderately rapid with moderate permeability to the gwl. Inherent erodibility of surface horizons is moderate; no active erosion was noted.

Soils are characterized by concurrent OM production, mineralization and redistribution, illuvial horizons of clay accumulation, altered subsurface horizons and fluventic modes of deposition. These soils are relatively well-developed.

Taxa identified are Aquic and Mollic Cryofluvents, and Argic, Argiaquic and Aquic Subgroups of Cryoborolls.

A typical profile has a mineral epipedon incoporating OM to the extent or approaching the extent definitive of a Mollic epipedon. Subsurface horizons are coarse-loamy particle-size class and often incorporate significant volumes of rounded coarse fragments.

These soils are similar to those described for DECE communities in terms of hydrologic characteristics. POPR communities seem somewhat more affected by fluventic deposition, incorporate greater volumes of coarse fragments and commonly exhibit somewhat greater in-situ pedogenic development.

Disturbance and Succession. Livestock grazing and gopher burrowing were the major disturbances observed in POPR communities. Relatively isolated sites show little recent grazing disturbance. Areas more accessible to livestock exhibit low plant stature and vigor; some sites, such as in the Pole Creek Meadow, may be grazed to the extent that no plant species are recognizable by late summer.

Poa pratensis is an introduced species capable of out-competing native grasses. Many POPR communities may once have been dominated by Deschampsia cespitosa or other herbs. However, distributions of the POPR and DECE cts overlap little in this study area, and some heavily grazed DECE sites lack Poa pratensis. Local abundance of Juncus balticus suggests that Poa may also invade JUBA communities.

Subsurface horizons of POPR soils may be comparable to a range of wet riparian cts from CARU to SADR/CACA. Soils of SAMY/POPR communities are

very similar to those of POPR. Concurrent OM production, mineralization and redistribution has progressed to a somewhat greater extent in POPR communities. Given the greater production figures of SAMY/POPR communities the opposite would be expected. The inference is that POPR may succeed from SAMY/POPR communities.

Progressive succession of POPR communites may be toward ASIN-FEID or POFR/DAIN communities.

Management. POPR communities are more extensively utilized by livestock than wetter adjacent sites. Communities are more sensitive indicators or grazing pressure than wetter communities but are generally less sensitive than DECE sites. Also, surfaces are somewhat less erodible and susceptible to compaction than are those of DECE communities.

Where adjacent to streams, banks are highly susceptible to fluventic erosion and sloughing under moderate loads.

Other Classifications. Tuhy (1981) and Norton et al. (1981) describe somewhat broader POPR cts in the Sawtooth Valley and in western Wyoming, respectively. Padgett (1981) mentions a similar type in eastern Oregon. Volland (1976) and Hall (1973) in Oregon describe broad community types with Poa pratensis dominant.

Salix myrtillifolia/Poa pratensis ct
(SAMY/POPR ct; blueberry willow/Kentucky bluegrass ct)

Location. SAMY/POPR communities are found primarily at lower and middle elevations in the eastern half of the study area, among mountains north of the Salmon River and in the White Cloud foothills. The distribution is similar to that of POPR communities.

Floristics and Physiognomy. Shrubs taller than 15 dm have at least 15% coverage, usually much greater. Salix myrtillifolia is most often dominant. Salix drummondiana is sometimes present, in places as the dominant (or only) tall shrub. Salix geyeriana and Alnus incana may be present but neither is dominant. Salix wolfii and Salix monticola are generally absent.

The composition of the understory of this group is rather diverse. Poa pratensis is usually present and often dominant. Other species with moderate to high constancy include Poa palustris, Equisetum arvense, Geum macrophyllum, Pyrola asarifolia and Juncus balticus. Calamagrostis canadensis is seldom present, never with more than 5% coverage. Carex aquatilis and/or Carex rostrata may be present with less than 30% total coverage. Mitella pentandra and Saxifraga arguta are absent. Trees are generally absent.

The tall shrubs are continuous and dense on some sites, open and clumpy on others. Understories are most dense in openings or intershrub corridors. Appearance of the SAMY/POPR ct is pictured in Figure 22.

Adjacent Communities. Wetter CARU and similar POPR communities may be mingled with SAMY/POPR stands in mosaic arrangement. Boundaries are mostly clear to gradual. ALIN-COST or various coarse-bar communities may separate SAMY/POPR sites from streams; boundaries are mostly clear. Elsewhere, SAMY/POPR communities occupy entire riparian zones. Adjoining upland areas belong to various Artemisia vaseyana, Pseudotsuga menziesii or Abies lasiocarpa habitat types, depending on elevation and aspect. Boundaries are distinct to clear.

Production. Figures, in g/m^2, are based on two sample sites.

Graminoids -	average:	73;	range:	48- 94;
Forbs -	average:	20;	range:	12- 28;
Total Herbaceous -	average:	93;	range:	60-122;
Shrubs -	average:	48;	range:	14- 81;
Total -	average:	141;	range:	74-203;

Figure 22. SAMY/POPR community.

Environmental Parameters. SAMY/POPR communities were observed in wide valleys. In some places these stands are adjacent to the stream, where they may form narrow fringes or be well-developed for some distance away. Some SAMY/POPR communities are separated from streamchannels by another narrow community. Other SAMY/POPR sites are located on benches far from the stream or approach toeslopes of adjacent uplands.

Surfaces are generally even or slightly convex; microtopography is mostly hummocky or undulating corresponding with shrub bases and intershrub corridors. Some SAMY/POPR sites are dissected by broad, shallow channels. Slopes are gentle, 1-3%, in broader valleys; gradients up to 20% were recorded on toeslopes or along small, steeper streams.

Soils. Soil and hydrologic parameters of these communities are very similar to those described for POPR communities. Soils are somewhat poorly to well drained with moderate to low AWC above the gwl. Infiltration is moderate to moderately rapid with moderately slow to rapid permeability to the gwl. Inherent erodibility is moderate to low and erosion of surface horizons ranges from none to moderate.

Processes reflected in soil morphology are characterized by fluventic deposition and concurrent moderate rates of OM production, mineralization and redistribution. The degree of mineralized OM accumulation in surface horizons is notably less than that of POPR communities, even though the production values are substantially higher for SAMY/POPR communities. The difference may be a function of time.

Most pedons indentified are Aquic or Typic Cryofluvents. Aquic Cryoborolls and a Mollic Cryofluvent were also identified. Particle-size classes range from fine-loamy to sandy.

A typical pedon has a thin mineral epipedon with organic matter content definitive of Mollic criteria except for thickness. Lithologic discontinuities are common.

Disturbance and Succession. Streamside communities are subject to periodic fluvial disturbance, and beaver activity occurs in the vicinity of some sites. Livestock tend to enlarge intershrub corridors, kill outer branches through repeated browsing, and accentuate microrelief by compacting their paths. Some SAMY/POPR communities appear decadent as from old age.

The non-native Poa pratensis can outcompete native meadow grasses under heavy grazing; its ability to replace Calamagrostis canadensis is less well known. Many SAMY/POPR communities occupy analogous positions and are pedogenically and physiognomically similar to sites with CACA understories.

As evidenced by buried organic horizons and mineral horizons incorporating significant amounts of mineralized OM, SAMY/POPR communities develop from wetter communities. Similarities in position suggest SADR/CACA communities as immediate predecessors although the transition periods are likely long interludes of sedimentation and in-situ pedogenesis. Depths of surface "A" horizons suggest SAMY/POPR communities may be replaced by herbaceous POPR communities given progressive succession. Trees may become established in drier SAMY/POPR stands.

Management. Livestock cannot utilize these sites as completely as similar herbaceous communities; travel by hoof (or foot) is often difficult through the dense shrubs. Where drier SAMY/POPR sites adjoin streams, banks are susceptible to sloughing; this may be aggravated by livestock. The potential is less than described for POPR communities.

Other Classifications. A few stands of the Salix drummondiana/Ribes lacustre/Thalictrum occidentale ct, described for the Sawtooth Valley by Tuhy (1981), are better placed in the SAMY/POPR ct. Norton et al. (1981) recognize a Salix boothii (= S. myrtillifolia)/POPR ct in western Wyoming; this is a more cohesive, widespread unit in its area than is the SAMY/POPR ct in cental Idaho. Padgett (1981) describes roughly similar communities dominated by Salix rigida var. mackenziana in eastern Orgegon.

Aster integrifolius-Festuca idahoensis ct
(ASIN-FEID ct; thick-stemmed aster - Idaho fescue ct)

Location. ASIN-FEID communities were observed scattered through much of the study area, mostly around the edges of broad, middle elevation meadows.

Floristics and Physiognomy. Species composition varies among communities of this type. These are "dry meadows" and usually contain Aster integrifolius, Festuca idahoensis, Bromus carinatus and/or Stipa occidentalis var. minor. Agropyron caninum ssp. majus var. majus (= A. trachycaulum) has high constancy but is not exclusive to these sites. Other common associates include Carex microptera, Koeleria cristata and Geum triflorum.

Poa pratensis may be present, sometimes with appreciable coverage. Juncus balticus and Deschampsia cespitosa are usually absent, or sometimes present in minor amounts.

Shrubs are generally absent, though Artemisia vaseyana may encroach on sites transitional to the ARVA/FEID ht. Trees are absent.

These herbaceous communities are not lush or turfy. The mix of forbs and graminoids is uniform over the site, but areas of bare ground are usually visible. Typical physiognomy is shown in Figure 23.

Adjacent Communities. Members of the DECE and POPR cts frequently border ASIN-FEID communities in lower, wetter positions toward valley centers. Boundaries are distinct to gradual.

Pinus contorta communities, representing the PICO/FEID, ABLA/CAGE and ABLA/VACA hts, may adjoin on upland positions, along with the ARVA/FEID ht.

Production. Figures, in g/m^2, are statistics from three sample sites.

Graminoids -	average:	21;	range:	7- 47;
Forbs -	average:	81;	range:	13-100;
Total Herbaceous -	average:	102;	range:	20-147;

Environmental Parameters. ASIN-FEID communities usually occur near sideslopes of broad valleys. One community was observed adjacent to a stream, but elevated 7 dm above the water level.

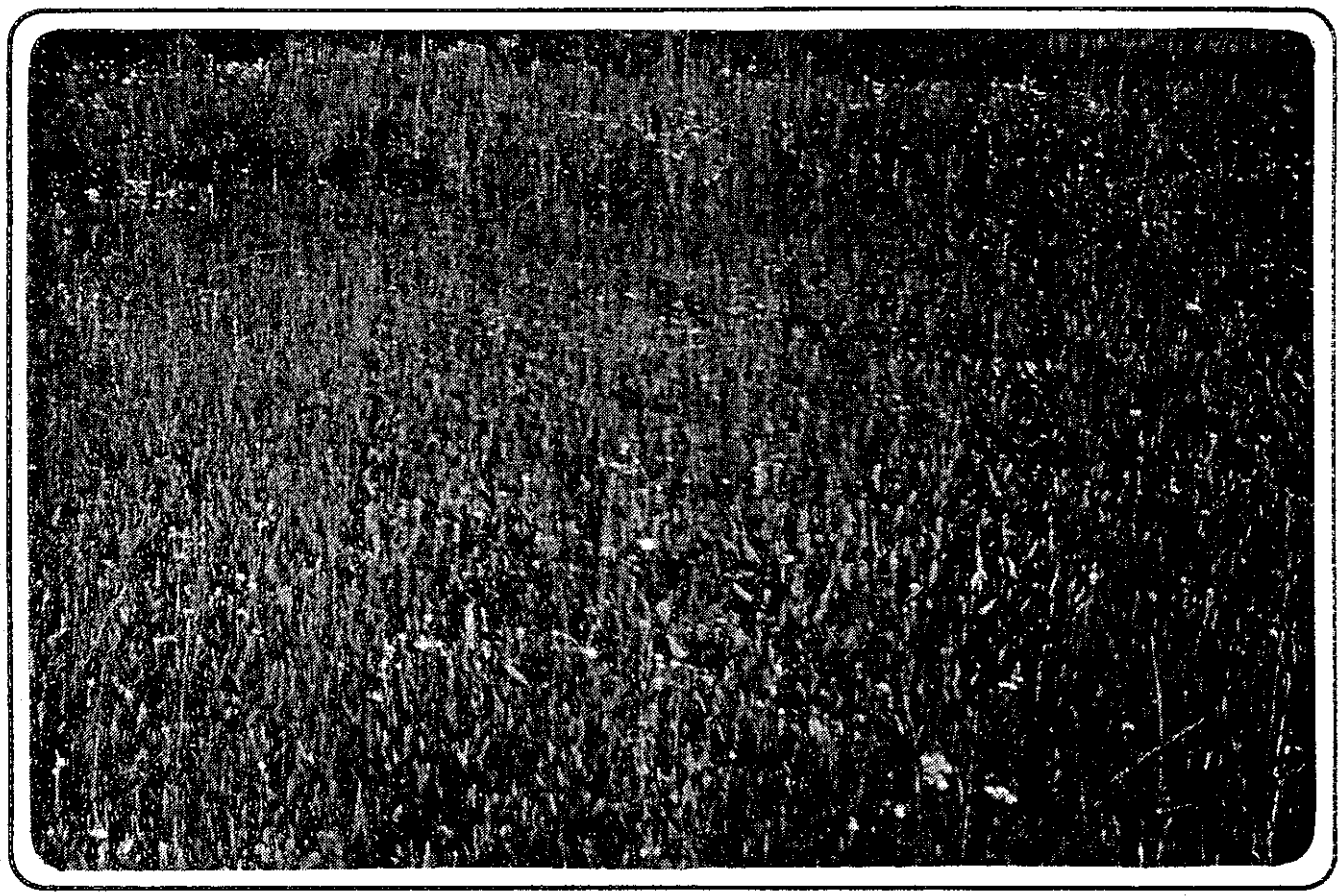

Figure 23. ASIN-FEID community.

Surfaces are even to slightly convex. Microtopography is mostly smooth except where gophers have mounded the surface. One community contained wide, shallow drainage rills, but they are usually absent. Slopes range from 2-6%.

ASIN-FEID sites are marginally-riparian or non-riparian by the plant and soil criteria presented in CHAPTER I. These communities are included in the classification because they are adjacent to riparian zones and are essentially undescribed for central Idaho.

Soils. Parameters of these communities are transitional between DECE and upland communities. Soils are moderately well drained with moderate AWC above the gwl. Infiltration is moderately slow to moderately rapid with slow to moderately rapid permeability to the gwl. Inherent erodibility of surface horizons varies from low to high but is generally moderate. Active erosion noted for sites ranges from none to slight.

These soils are characterized by advanced in-situ pedogenesis: mineralized OM distributed in relatively thick surface horizons and subsurface horizons of illuvial clay accumulation. The positions of communities are above that normally affected by fluvial processes and below that affected by major colluvial processes.

Taxa identified are Argiaquic, Pachic, and Typic Subgroups of Cryoborolls. Particle-size classes range from fine-loamy to sandy-skeletal. Textures generally become coarser and incorporate greater volumes of rounded- to subangular-coarse fragments with depth.

A typical profile has a Mollic epipedon 25 cm or more thick subtended by a horizon of illuvial clay accumulation (Argillic horizon) or a horizon transitional to underlying "C" horizons (AC horizon). Deeper horizons are unaffected by pedogenic processes other than oxidation/reduction of metal compounds.

Disturbance and Succession. Livestock grazing and rodent burrowing are the greatest sources of disturbance in ASIN-FEID communities. Most communities are moderately disturbed; plants such as Taraxacum officinale, Wyethia helianthoides and Cirsium spp. are evidence of this.

These communities appear to be relatively stable, though many are in seral stages of secondary succession. Absence of Artemisia vasyanana and Pinus contorta suggests that neither of these species will succeed on ASIN-FEID sites, even though ARVA and PICO communities are nearby.

Management. ASIN-FEID communities are less resistant to grazing pressure than nearby wetter sites, and are more sensitive indicators of

overgrazing. Mueggler and Stewart (1978) discuss more detailed range management concepts for their related FEID/AGCA type.

Where ASIN-FEID communities are adjacent to streams, the banks are highly susceptible to fluventic erosion, and sloughing may be aggravated by livestock. Some surfaces are highly erodible and may contribute sizable sediment loads to streams unless managed properly.

Other Classifications. This ASIN-FEID ct includes both the ASIN-FEID and Bromus spp.-Stipa occidentalis cts described by Tuhy (1981). Mueggler and Stewart (1978) recognize a similar Festuca idahoensis/Agropyron caninum type in western Montana.

Potentilla fruticosa/Danthonia intermedia ct
(POFR/DAIN ct; shrubby cinquefoil/timber oatgrass ct)

Location. POFR/DAIN communities are scattered through the study area except at upper elevations and in the lower canyons. They are best developed in broad, middle-elevation valleys.

Floristics and Physiognomy. Potentilla fruticosa has at least 15% coverage, usually greater. Other shrubs may be present in trace amounts, but are usually absent. Pinus contorta regeneration is sometimes present in small amounts.

Potentilla fruticosa occupies a wide range of habitats; understory composition may be quite diverse among communities. The central tendency of the POFR/DAIN ct is a rather dry bottomland habitat where the Potentilla consistently forms a discontinuous but pure low shrub stratum. Among herbaceous associates, Danthonia intermedia is usually present, often with over 5% cover. Other high constancy herbs include Agropyron caninum, Koeleria cristata, Achillea millefolium, Geum triflorum and Potentilla gracilis. Moister sites contain Deschampsia cespitosa, Juncus balticus or Poa pratensis. Festuca idahoensis is sometimes present but never abundant.

The low dark-green Potentilla fruticosa and short spikelike inflorescences of Danthonia intermedia are visually characteristic. The herbaceous stratum contains a varied mix of forbs and graminoids. Community appearance is illustrated in Figure 24.

Adjacent Communities. Various Salix wolfii communities frequently border POFR/DAIN sites in wetter habitats; boundaries are mostly clear. Where POFR/DAIN communities are the moistest sites in an area, surrounding upland vegetation may be characteristic of various Artemisia vaseyana, Pinus contorta or Abies lasiocarpa hts. Boundaries with these communities are clear to gradual.

Production. Statistics, in g/m^2, are of three sample sites.

Graminoids -	average:	40;	range:	31-45;
Forbs -	average:	23;	range:	17-35;
Total Herbaceous -	average:	63:	range:	48-80;
Shrubs -	average:	11;	range:	3-18;
Total -	average:	74;	range:	51-98;

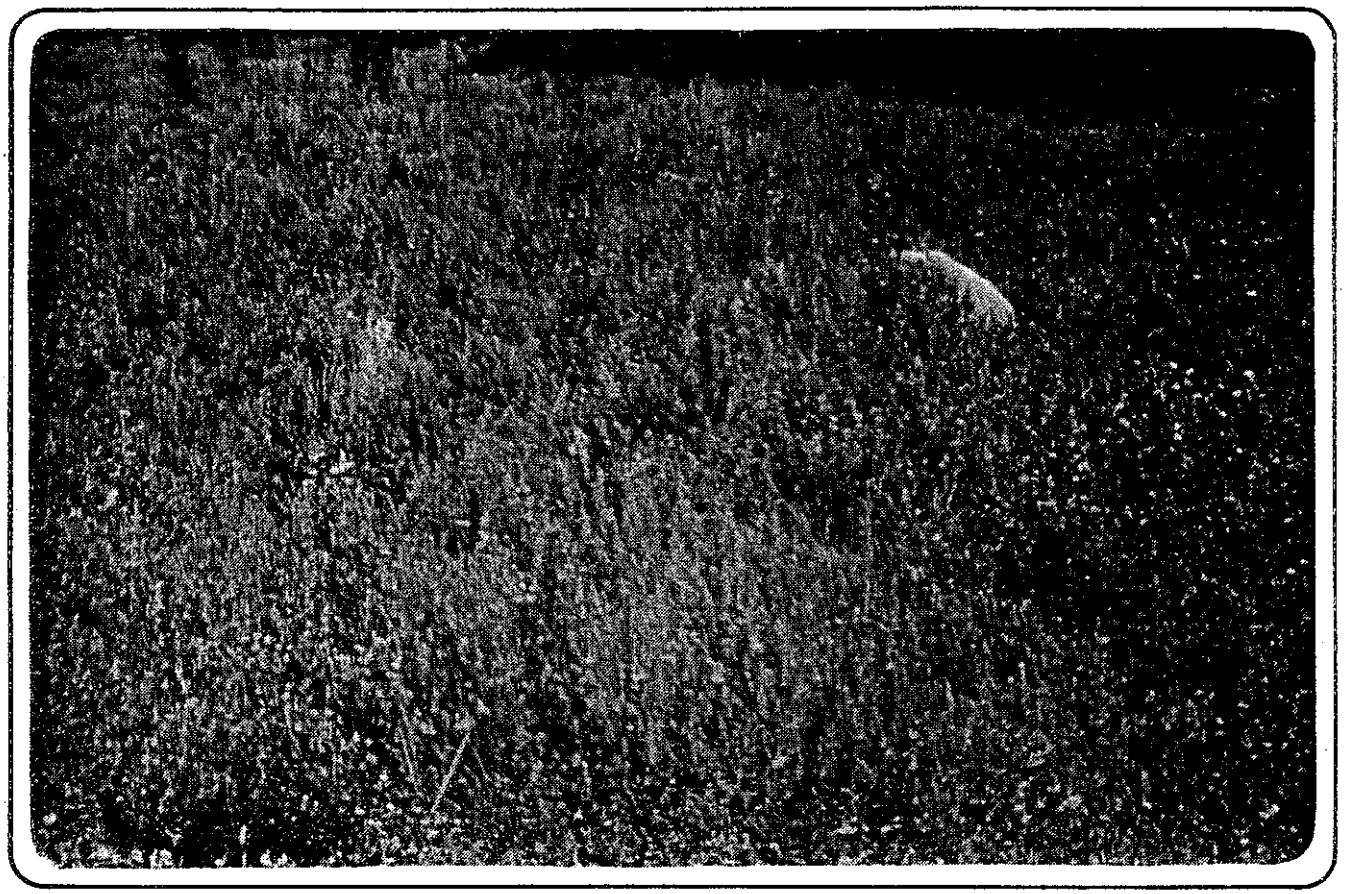

Figure 24. POFR/DAIN community.

Environmental Parameters. These communities may occupy positions along small, ephemeral drainages in broad valley systems. Drainages are usually dry except during intense precipitation events. Other positions include floodplain terraces that are elevated 7-15 dm above stream levels, and concavities surrounded by upland vegetation. POFR/DAIN sites are rarely adjacent to streams.

Sites are even to broadly concave. Microtopography is generally slightly hummocky or undulating and is sometimes mounded by rodents. Slopes range from 1-5%, generally within the lower range.

These communities are marginally riparian to non-riparian by the plant and soil criteria presented in CHAPTER I. They are included in this classification because they occur in valley bottoms and are essentially undescribed for central Idaho.

Soils. Surface horizons of these communities are dry for most of the growing season. Soils are moderately well to well drained with moderate AWC above the gwl. Infiltration and permeability to the gwl are moderate to moderately rapid. Inherent erodibility and observed erosion levels are low to moderate.

Profiles are characterized by processes of in-situ pedogenesis. Groundwater levels are normally at or below 100 cm. Pedons are classified as Typic Cryoborolls, Typic Cryochrepts, and Aquic and Mollic Subgroups of Cryoboralfs. A Typic Cryofluvent was also identified. Particle-size classes range from fine-loamy to sandy-skeletal.

A typical profile has a surface horizon with mineralized OM content definitive of a Mollic epipedon or of Mollic criteria except for depth. The horizon subtending the epipedon is a horizon with illuvial clay accumulation (argillic horizon), a horizon altered by other pedogenic processes (cambic), or a horizon transitional in character between overlying "A" horizons and underlying "C" horizons. Underlying horizons are commonly sandy-loam texture or coarser and incorporate significant volumes of coarse fragments.

Disturbance and Succession. Rodent burrowing and livestock grazing are the most appreciable disturbances in POFR/DAIN communities. Long term heavy sheep grazing may reduce density and vigor of Potentilla fruticosa, though normally this species increases under sheep or cattle grazing.

Management. POFR/DAIN communities are more sensitive indicators of grazing pressure than wetter riparian habitats. Mueggler and Stewart (1978) write that Potentilla fruticosa is normally not extensively utilized by either livestock or big game animals, and that appreciable use of the shrub usually indicates overgrazing unless the range is on a

rest-rotation management system.

Other Classifications. The POFR/DAIN ct essentially includes the POFR/POPR and POFR/DAIN cts described by Tuhy (1981) in the Sawtooth Valley. Moist and dry subsets of this POFR/DAIN ct may still be recognized by managers if desired.

Norton et al. (1981) observed similar communities in western Wyoming, but considered them non-riparian. Mueggler and Stewart (1978) describe a POFR/Fesuca scabrella type in western Montana, with Danthonia intermedia indicating a moist subtype. These authors also recognize a POFR/Festuca idahoensis type with characteristics that match some study area POFR/DAIN sites.

Alnus incana-Cornus stolonifera ct
(ALIN-COST ct; mountain alder-red osier dogwood ct)

Location. ALIN-COST communities are confined to the narrow, lower elevation canyons of the Salmon and Middle Fork Salmon Rivers and their tributaries. Communities sometimes occur outside this zone in special edaphic situations.

Floristics and Physiognomy. Alnus incana and/or Cornus stolonifera dominate a dense, tall-shrub stratum. Neither species is shorter than 15 dm at maturity. The Cornus reaches 30 dm tall and is always shrubby; the Alnus is shrubby or may form small trees to 10 m tall.

Ribes lacustre is often present in small amounts, though it rarely forms even a discontinuous low-shrub stratum. Salix spp. are seldom present, never with more than 5% total coverage. Mature Populus trichocarpa or conifer individuals may surmount ALIN-COST communities, but overall these are not forested sites.

No species name is given to characterize the herbaceous stratum, because understories are quite variable. One sample plot did not contain a single herbaceous plant beneath the shrub thicket. Calamagrostis canadensis, Galium triflorum, Angelica arguta, Equisetum arvense and Smilacina stellata have moderately-high constancy where overstories are less dense. Figure 25 illustrates the ALIN-COST ct.

Adjacent Communities. Where streambanks slope immediately upward, ALIN-COST communities are usually the sole occupants of the riparian zone. Adjacent slopes belong to Pseudotsuga menziesii or Abies lasiocarpa hts; boundaries are usually clear.

On small flats, ABLA/CACA, SADR/CACA, and/or Salix exigua ssp. exigua communities may adjoin ALIN-COST stands. Boundaries are mostly gradual.

Production. Figures, in g/m^2, are based on three sample locations.

Graminoids -	average:	4;	range:	0- 13;
Forbs -	average:	7;	range:	0- 13;
Total Herbaceous -	average:	11;	range:	0- 26;
Shrubs -	average:	260;	range:	46-672;
Total -	average:	271;	range:	46-698;

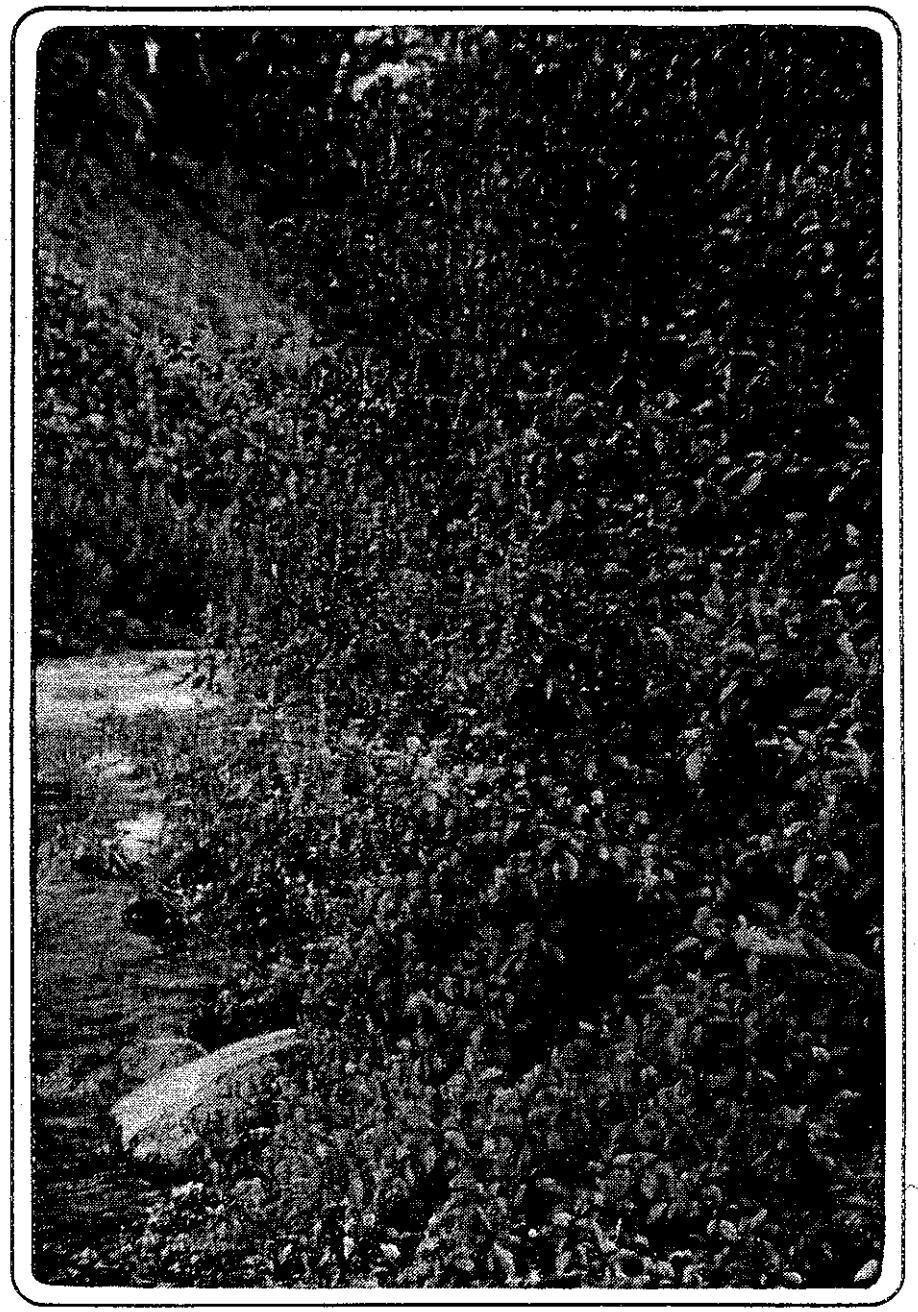

Figure 25. ALIN-COST community.

Environmental Parameters. ALIN-COST communities are virtually restricted to streambanks in narrow V-canyons. Along smaller streams communities are reduced to narrow fringes. Along larger streams, such as Warm Springs Creek and the Salmon River, the bottom may be wider than 100 m. In these wider systems ALIN-COST stands are adjacent to the channel but may cover small flats up to 15 m wide. Height above stream level varies from 5cm to 2 m; greater values reflect positions on banks which rise immediately from the channel. Alnus incana also dominates some convex positions on the Yankee Fork dredge tailings.

Microtopography is mostly irregular; surface conformations are thin, undecomposed litter over cobbles and stones. On small floodplain flats the surface may be relatively smooth, or undulating with the long axis parallel to the stream. Slopes vary from 3-35%.

Soils. Although generally adjacent to stream channels, these communities are among the driest types described. Soils are excessively to somewhat poorly drained with generally low AWC above gwl. Infiltration and permeability to the gwl are very rapid to moderately rapid. Inherent erodibility is low to moderate while most sites are moderately to severely eroded.

Surfaces are affected by infrequent, catastrophic fluvial and colluvial processes inherent in V-canyons. Surface mineral horizons are thin and low in OM. Ped structure is generally poorly developed or entirely lacking. Most taxa are Typic and Aquic Cryofluvents. A Typic Cryorthent was also described.

Soil pedons reflect the frequency and intensity of fluvial disturbance. Those pedons with loamy epipedons incorporating mineralized OM and no coarse fragments are characteristic of low- intensity, infrequent events. Pedons characteristic of frequent, high-intensity events have sandy surface horizons devoid of OM except for scraps of the current season's litter, and incorporate significant volumes of rounded boulders, stones and cobbles.

Disturbance and Succession. Disturbance is primarily of fluvial nature. The dredging of the Yankee Fork created edaphic conditions in which the Alnus has proliferated.

Where ALIN-COST stands form a bank fringe in wider bottoms, conifers may become established and suppress or eliminate the shrubs through shading. These sites may be small seral fragments of the ABLA/CACA or Picea engelmannii/Galium triflorum hts, though many ALIN-COST stands will not become "forested" in the forseeable future.

Management. Minor effects of livestock grazing or wildlife browsing were observed; response to these factors is probably slight.

Surface sediments comprising ALIN-COST soils are recently deposited fluvial and/or colluvial material. OM content of surface horizons is low and ped structure is lacking or poorly developed. Surfaces are highly unstable and may be conceptualized as "on the dock awaiting transport".

Other Classifications. Norton et al. (1981) describe a similar Cornus stolonifera/Galium triflorum ct along the lower Greys River, Wyoming with Alnus incana usually codominant. These workers also noted this type with Betula occidentalis along lower portions of canyons east of Star Valley. Padgett (1981) recognizes an ALIN type in eastern Oregon than lacks Cornus stolonifera; understory vegetation is also variable.

The authors of this report observed Alnus fringes along portions of the South Fork Salmon River. They also noted Alnus-Cornus-Betula-Salix exigua mosaics in Logan Canyon, Utah, and along the North Fork Salmon River north of Salmon, Idaho. This is a widespread community type in the Intermountain region.

Incidental Riparian Communities

Some riparian communities in the study area do not fit well within or between types described. These recur so infrequently that they do not serve as an adequate base for community-type classification. These incidental riparian communities are now discussed.

Carex simulata (CASI) Communities

Carex simulata dominates some wet depressions. Lesser amounts of Carex rostrata or Eleocharis pauciflora are often present, although some sites are nearly pure C. simulata. For management purposes these may be included with the related CARO or ELPA cts, based on associated species, soil and environmental characteristics.

Mitella pentandra (MIPE) Communities

These are moderately to strongly sloping, seepy sites with Mitella pentandra, Saxifraga arguta, Aconitum columbianum and/or Senecio triangularis prevalent among a stratum of wet-site herbs. Trees are absent, but usually grow nearby. Shrubs are often present, with Salix monticola, Salix drummondianna, or Alnus incana forming a discontinuous layer more than 15 dm tall.

These communities are wetted to the surface by flowing groundwater. Soils are very poorly drained with moderate to high AWC. Infiltration and permeability to the gwl are rapid. Surface horizons are characteristically fibrous organic horizons resistant to the forces of fluvial erosion. Although resistant, surface organic horizons are in an approximate "steady state" of production and erosion. Surfaces are probably eroded frequently and rapidly regrown.

Processes characterizing the systems are erosion of surface organic horizons and rapid organic regeneration. Soils are fragmental, skeletal and coarse loamy families of Typic Cryaquents and Aquic Cryofluvents. Profiles commonly have a relatively thin organic surface horizon over unaltered horizons which often incorporate significant volumes of coarse materials.

These communities are generally located near source waters of larger drainage systems. Surface organic horizons may function as initial filters to sediments of upland runoff and surfacing groundwater. Other principal functions of MIPE communities are to delight the eye with their cool freshness and provide comfort after an uphill climb.

Shrubby sites are related to the Salix boothii/Mitella pentranda ct described by Norton et al. (1981).

Alnus sinuata-Menziesia ferruginea (ALSI-MEFE) Communities

These communities are narrow fringes along small, steep, rocky drainages, generally surrounded by upland forests. They were observed in gullies which drain into Redfish Canyon, Hellroaring Lake and elsewhere in the Sawtooth Range.

Alnus sinuata and Menziesia ferruginea dominate a shrubby assemblage above a moist herbaceous understory. These are hardly forest communities, but may be outlyers related to the more northern ABLA/MEFE or ABLA/ALSI hts (Daubenmire and Daubenmire, 1968; Steele et al., 1979b).

Salix exigua ssp. exigua (SAEX) Communities

In the lower eastern part of the study area, scattered communities were noted with Salix exigua ssp. exigua conspicuous. These communities develop on sites morphologically similar to those of AGSC-streambar communities. Soils are somewhat to very poorly drained with very low AWC above the gwl. Infiltration and permeability to the gwl are very rapid and surfaces are very severely eroded.

Systems are affected by fluvial erosion. Characteristics which develop via other pedogenic processes are whisked away by frequent fluvial events or are so undeveloped that they are not apparent. Soils are Aquic and Typic Cryofluvents. Pedons are characterized by sandy surface horizons incorporating significant volumes of rounded gravel and cobbles. Particle-size classes are sandy-skeletal or fragmental.

Norton et al. (1981) describe a SAEX/POPR ct in western Wyoming. Padgett (1981) recognizes a Salix exigua ct in eastern Oregon. The authors of this report have observed similar communities elsewhere in the West; this is a widespread type.

In the study area, S. exigua ssp. exigua seems morphologically distinct from ssp. melanopsis, although this is not consistent throughout the range of S. exigua. Because both subspecies occur on coarse streambanks, taxonomic separation is not vital for classification or for most management purposes. Revegetation efforts may be enhanced by the knowledge that ssp. melanopsis generally is found at higher elevations than ssp. exigua.

Artemisia cana (ARCA) Communities

These communities were seldom observed in the study area, except as scattered stringers elevated 10 dm or more above streams in and around the Sawtooth Valley.

Artemisia cana ssp. viscidula dominates a low shrub stratum which may contain small amounts of Potentilla fruticosa and/or Artemisia vaseyana. Tall shrubs are absent.

Understories are diverse, mainly comprised of drier-site species such as Agropyron caninum, Festuca idahoensis, Koeleria cristata, Antennaria microphylla and/or Potentilla gracilis.

Soils were investigated on two sites. Profiles are well drained with gwls at or below 100 cm. AWC, infiltration, permeability, and inherent erodibility are all moderate. Pedons are a Mollic Cryoboralf and an Aquic Cryoboroll. Morphologies are characteristic of advanced in-situ pedogenesis to a degree transitional to upland soils.

ARCA sites are marginally riparian or non-riparian by plant and soil criteria presented in CHAPTER I. They are included because Artemisia cana requires moisture beyond that supplied by on-site precipitation; however, most associated herbs also flourish in drier upland habitats and cannot grow on very wet sites. Small sustained changes in groundwater levels may cause a shift in shrub dominance to Potentilla fruticosa (wetter) or Artemisia vaseyana (drier).

Schlatterer (1972) and Tuhy (1981) describe ARCA/FEID types in central Idaho. Hironaka and Fosberg (1979) mention an ARCA type in their southern Idaho shrub and grassland classification. Padgett (1981) describes a similar type in eastern Oregon. Norton et al. (1981) sampled several ARCA communities in the Greys River drainage of western Wyoming, but did not consider them wetland riparian.

Populus trichocarpa (POTR1) Communities

Along the lower eastern portion of the Salmon River, mature Populus trichocarpa forms small stands on narrow floodplains. Understories are shrubby. More often, the Populus forms a discontinuous layer above a narrow fringe of Alnus incana, Cornus stolonifera and/or Salix exigua. Populus stands are better developed farther downstream.

Forest Habitat Types

Climax riparian forest communities indicative of two or possibly three habitat types were observed in the study area. These are briefly discussed below; more detailed descriptions may be found in Steele et al. (1979b).

Abies lasiocarpa/Calamagrostis canadensis ht; ABLA/CACA ht

Climax ABLA/CACA communities are found throughout the study area on small flats, in narrow canyons or in locations above the broad, middle-elevation valleys.

Pinus contorta, Picea engelmannii and/or Abies lasiocarpa dominate a conifer overstory. Abies lasiocarpa is reproducing successfully. Calamagrostis canadensis has at least 5% coverage among wet site herbs in the understory.

Many communities of the widespread SABR/CACA ct may be seral stages of the ABLA/CACA ht. Development of a climax forested state is often thwarted by periodic fluvial disturbance.

ABLA/CACA hts are described by Pfister et al. (1977) in Montana, Henderson et al. (1977) in the Uinta Mountains, Utah, and Steele et al. (1979a) in western Wyoming.

Abies lasiocarpa/Streptopus amplexifolius ht; ABLA/STAM ht

Near-climax ABLA/STAM communities are individually small and are widely scattered in upper reaches of valley bottoms within the study area.

Picea engelmannii usually dominates the overstory; Abies lasiocarpa and Pinus contorta overstory are less common. Abies lasiocarpa is reproducing successfully. The understory is a collection of wet-site herbs. Senecio triangularis, Aconitum columbianum, Mitella pentandra and/or Saxifraga arguta are present with over 5% aggregate coverage. Streptopus amplexifolius was seldom observed because sites are small, without dense conifer canopy. Calamagrostis canadensis has less than 5% coverage.

ABLA/STAM communities occur on narrow floodplains, usually confined to a fringe along the channel; other positions include wet benches and seepy toeslopes. Small rivulets or wet depressions are common.

ABLA/STAM hts are described by Henderson et al. (1977) in the Uinta Mountains, Utah; and by Steele et al. (1979a) as an incidental type in eastern Idaho and western Wyoming.

Picea engelmannii/Equisetum arvense ht; PIEN/EQAR ht

A few small communities were observed with Picea engelmannii overstory and regeneration, above a carpet of Equisetum arvense. Abies lasiocarpa was rare or absent. Floristically these resemble PIEN/EQAR climax communities. These are also floristically and ecologically similar to mature ABLA/STAM communities, and for most purposes can be included with the ABLA/STAM ht.

PICEA/EQAR habitats are more widespread to the east of the study area, where other Picea species and hybrids are successful outside the ecological limits of Abies lasiocarpa. Pfister et al. (1977) and Steele et al. (1979a) describe PICEA/EQAR hts.

Major Upland Communities

One shrub type and three forest types (Hironaka and Fosberg, 1979; Steele et al. 1979b) are widespread on upland habitats in valley bottoms of the study area. These occupy the highest and driest bottomland sites, and usually extend onto sideslopes.

Artemisia vaseyana/Festuca idahoensis ht; ARVA/FEID HT

These sites occur extensively on dry benches and moraines associated with broad, middle-elevation valleys.

Artemisia vaseyana dominates a low shrub stratum. Bottomland sites seldom contain Symphoricarpos oreophilus or Ribes cereum. Understories are collections of drier-site species typified by Festuca idahoensis; Agropyron spicatum is scarce or absent.

Scattered Pinus contorta grow on ARVA/FEID sites transitional to the following three forest habitat types.

Pinus contorta/Festuca idahoensis ht; PICO/FEID ht

Pinus contorta is essentially climax on these dry sites. Abies lasiocarpa is seldom present, and where present is hardly reproducing successfully. Festuca idahoensis is present in a typically sparse understory which often contains Poa nervosa or Sitanion hystrix but lacks species indicative of moister habitats.

The PICO/FEID ht seems to be a broad transition between ARVA/FEID and ABLA/CAGE hts.

Abies lasiocarpa/Carex geyeri ht; ABLA/CAGE ht

Pinus contorta usually dominates these stands, though Abies lasiocarpa is reproducing successfully on most sites. Carex geyeri has at least 5% coverage in an understory which lacks species indicative of moister habitats. Ribes cereum and/or Shepherdia canadensis may form a discontinuous low-shrub stratum; this may indicate a climax subtype or more likely a seral stage.

Abies lasiocarpa/Vaccinium caespitosum ht; ABLA/VACA ht

Pinus contorta generally dominates the overstory,, though Abies lasiocarpa reproduces successfully on most sites. Vaccinium caespitosum has a least 1% coverage in a typically depauperate understory which frequently also contains Epilobium angustifolium and Fragaria virginiana. Spiraea douglasii may be present; Calamagrostis canadensis is absent.

Other Upland Types

Valley bottoms may support small areas of the Abies lasiocarpa/Vaccinium scoparium ht, Abies lasiocarpa /Calamagrostis rubescens ht, and various Pseudotsuga menziesii hts. These are more common on adjacent slopes.

Community Concepts

Successional trends were inferred from the merger of two distinct methods of conceptualization:

1. The first method is developed from soil, hydrologic and environmental data for given community types. Community-type states and dominant inherent processes were determined. Inferences of projected states of systems were developed by extrapolating rates and directions of temporal processes currently dominating systems. Projected states were correlated with soil, hydrologic and environmental parameters described for existing community types. Successional inferences are products of the degree of conceptual correlation. Evidence of some pedogenic processes remains apparent in the morphology for long periods. Trends were inferred from this evidence. Successional inferences deduced by extrapolation of processes were verified.

2. The second method is developed from observations of the relative positions and degree of transitions between communities. It seems reasonable that transitions between adjacent communities may reflect temporal transitions. Spatial transitions across distinctive states may be similar to temporal transitions involving ecosystem processes.

Environmental/Soil/Hydrologic Parameters

Analysis of Variance. Results of AOV on some environmental, soil and hydrologic parameters are presented in Table 5. All factors except elevation are significant at the 95% confidence level. Although not determined statistically significant, some inferences of distribution for community types with elevation were derived from observation and are discussed with respect to community patterns.

Slopes of communities are effectively a statement of position and affect system processes and resulting system states. Principal processes affected by slope are the degree of fluvial and colluvial erosion/deposition, and water flow into or through systems. MIPE and ALIN-COST communities are significantly steeper than other riparian types. MIPE communities are further characterized by groundwater flowing at or near the soil surface. Flowing groundwater brings dissolved oxygen into the system, creating a state conducive to OM proliferation. OM proliferation is evidenced by surface organic horizons of MIPE communities. ALIN-COST communities are characteristicsily coarse textured, well to excessively drained and reflective of frequent colluvial and fluvial erosion/deposition. The example illustrates the multidimensional nature of system interactions. Interactions are further discussed with respect significant factors.

Table 5. Mean determinations and results of AOV of some environmental, soil and hydrologic parameters of community types.

Community	n	Elev (ft)	Sl (%)	gwl (cm)	Capillary Fringe (cm)	AWC (%)	Coarse Frag (%)	Organic Horizons (%)	"A" Horizons (cm)	pH
AGSC-gravel	8	6852	2a	28abc	16abcd	4a	62e	4b	0a	6.6b
AGSC-sand	5	6585	0a	33bcd	12abc	8ab	8ab	13c	0a	6.5ab
ELPA	9	6978	2a	3a	0a	25	5ab	89e	4ab	6.3ab
CARO	13	6662	2a	24ab	11abc	20e	4ab	42cd	16efg	6.6b
SALIX/CARO	11	6701	2a	40bcd	8ab	22e	2a	50cd	18fgh	6.2a
SACO/CASC	3	7022	3a	27ab	0a	27f	4a	84e	6abcd	6.5b
MIPE	5	6886	18c	30abcd	8ab	17de	23cd	46cd	5abc	6.2a
SAWO/SWPE	15	6450	4a	43bcde	4a	24f	5ab	66de	8abcdef	6.2a
VAOC	10	6724	2a	55cdef	16abcd	17de	12abc	34bc	7abcde	6.3ab
JUBA	5	6798	4a	63ef	47cdef	17de	10abc	32bc	16defg	6.4ab
SADR/CACA	17	6605	3a	57def	35bcde	12bcd	12abc	15abc	10bcdef	6.5b
SAGE/CACA	9	6598	2a	96gh	69fgh	13bcd	3a	1a	23gh	6.6b
SAWO/CAMI	4	6785	4a	77fg	62efg	14cd	6ab	0a	32i	6.4ab
DECE	9	6816	2a	77fg	54ef	14cd	8ab	2a	27hi	6.3ab
POPR	8	6851	3a	78fg	53e	11bc	19bcd	1a	17efgh	6.5b
SAMY/POPR	10	6241	5a	78fg	66fgh	12bcd	8ab	3a	9abcdef	7.3c
ASIN-FEID	6	6885	3a	91fg	72fgh	14cd	15abcd	0a	33i	6.6b
SAEX	3	6077	3a	44bcd	37cde	8ab	58e	0a	0a	7.3c
ALIN-CUST	9	6033	9b	101gh	87ghi	4a	29d	3a	3ab	7.0c
POFR/DAIN	8	6785	2a	119hi	92hi	13bcd	7ab	0a	16j	6.6b
ARCA	2	7165	3a	132i	114i	14cd	2a	0a	14i	6.4ab

*Values followed by a same letter are not significantly different at the 95% confidence level.

Depth to ground water (gwl) is a principal significant parameter of state. The arrangement of community types in Table 5 is generally in order of increasing depth to gwls. The order is also the general direction of succession from wet to dry. AGSC-streambars, conceptualized as both the beginning point of succession and the limit of regression, are listed first although these systems are effectively among the driest. Other parameters are discussed with respect to the direction and degree of correlation with gwls as arranged in Table 5.

Depth to the top of the capillary fringe is directly related to gwl. The height to which water rises above the gwl is further a function of texture, coarse-fragment composition, OM content and degree of flocculation of soil material into peds.

Available water-holding capacity (AWC) is generally inversely correlated with gwl. The trend is predominantly a response to OM proliferation on surfaces at or near gwl. Also, as surfaces develop above the normal flood level, sediments are characteristically finer-textured and include fewer coarse fragments. These sediments have somewhat greater water retention capacity than subtending coarser horizons. In drier systems, surface horizons are generally flocculated into moderate or strong structure which increases AWC. As presented in Table 5, processes are generally reflected in high AWC for communities at or near gwl, moderate AWC for communities at moderate depths above the gwl and a slight increase in AWC for communities developed well above gwl.

Values of coarse fragment composition listed in Table 5 are the average volumes of gravel, cobbles and stones above the gwl. Material below gwls generally becomes coarser to the fragmental quaternary glacial deposits and stream alluvium which underly riparian positions at a relatively shallow depth. AGSC-bar surfaces are effectively the interface between these geologic materials and soil. Materials developing at or near gwl are characteristically organic and coarse fragments are few or absent. Surface horizons of drier communities are well above the levels of high energy flooding events required for transport of coarse fragments. Communities with moderate gwls (central positions of Table 5) are highest in coarse-fragment composition. MIPE and ALIN-COST communities are further affected by position relative to fluvial and colluvial sources of coarse fragments.

The average percent volume of organic horizons above the gwl is directly related to gwl. Surfaces at or near gwl favor OM proliferation disproportionate to subsequent mineralization. Mineralization of OM at a rate approximating its production characterizes surfaces well above gwl. The trend is quite apparent in Table 5.

The depth of surface mineral horizons incorporating significant amounts of mineralized OM ("A" horizons) is inversely related to gwl, and is modified by the rate of floristic production and factors which affect the redistribution of mineralized OM within profiles. ALIN-COST communities are further affected by colluvial and fluvial erosion which remove surface horizons at a rate approximately equal to that at which they form.

Average pH of riparian soils generally becomes more neutral above gwl. This was noted both within distinct profiles and for successively drier communities as presented in Table 5. The minor but significant differences in hydrogen ion activity reflect the predominance of reduction reactions in saturated horizons versus oxidation in aerated horizons. Geologic parent materials may also be an important factor of significantly different pH values.

Some other factors not tabulated in Table 5 were analyzed for levels of significance. The depth of organic horizons is significantly different among some community types. The range is somewhat greater than that calculated for percent volume of organic horizons above the gwl. In some cases material below the gwl could not be extracted for observation. Organic horizons often extend well below normal gwls. Besides being a more reliable indicator, percent volume of organic horizons above the gwl is more characteristic of current processes and states of surface horizons.

The sum thickness of organic horizons and "A" horizons is also a significant factor. The analysis delineated some community types which are characterized by surface or buried organic horizons in addition to "A" horizons. These groupings are transitional between wet and dry states. Total depths of "A" and "O" horizons are more clearly delineated with respect to linear ranking.

Given the degree of correlation between significant factors, it is highly probable that two- and three-way combinations of factors are also significant, although this was not tested.

Ranking of Factor Variables. Each significant factor of AOV was clustered according to linear relations between samples. Generally, plots within clusters were not of a single community type; plots of very dissimilar character were sometimes linearly adjacent. Recalling the discussion with respect to similar slopes between MIPE and ALIN-COST communities, this is not suprising. Parameters may not be interpreted unless viewed in context with associated parameters. A principal function of linear ranking was to determine relationships among parameters of state for a given community type.

Mean values for some characteristics of community types were ranked on scales standardized to approximate maximum and minimum values. Results are presented in Figure 26.

As indicated in the figure, communities are more distinctly segregated in relation to gwl, AWC and thickness of "A" horizons. Other parameters tend to cluster communities into groups toward the wet or dry extremes.

Most parameters of riparian ecosystems are directly or indirectly related to gwl, which is itself a reflection of normal stream flow level. Based on this observation, gwl is arbitrarily defined as the "master variable". Changes in the state of the system are traced from changes in gwl relative to the surface. Given a change in gwl, the influence on processes affecting other states of the system may be predicted. Inferences of successional trends are a synthesis of interpretations of past and future states of systems as evidenced in soil morphology.

Cluster Analysis. Various combinations of significant variables were manipulated with cluster analysis. No combination of attributes adequately delineated all community types. Generally, one or two plot clusters of the same floristic type would be apparent for a given set of attributes. Clustering of different attributes resulted in grouping of different community types. The situation in exemplified in Figure 27.

Mean values for AWC of community types relative to gwl are plotted. Ranges indicated by dashed lines are one standard deviation. A few types are distinct, though most are aggregated in relatively indistinct central clusters. This was the case for most cluster analyses. A principal function of cluster analysis was to verify principal processes and states which influence community systems.

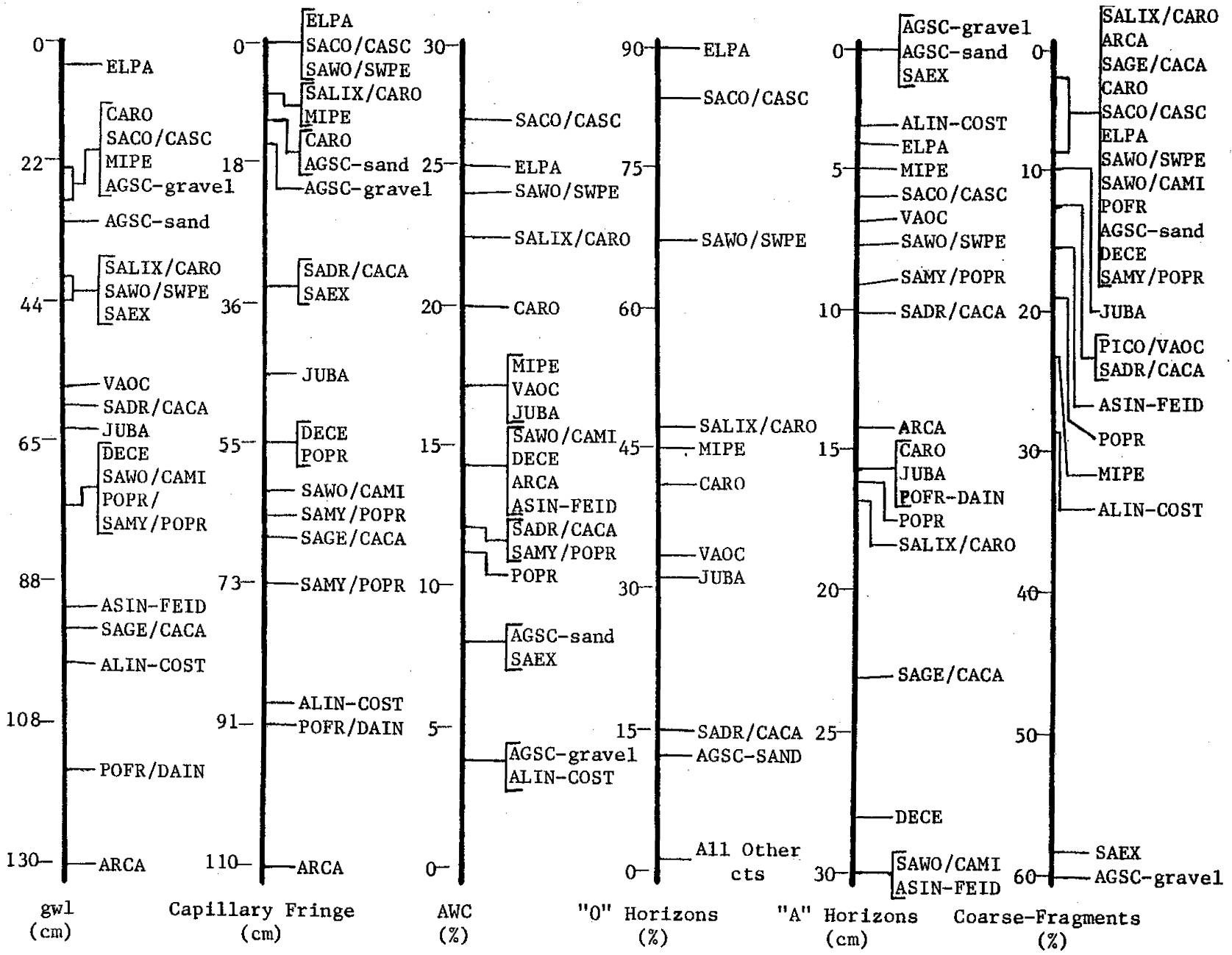

Figure 26. Summary of ranking of some soil and hydrologic parameters of community types.

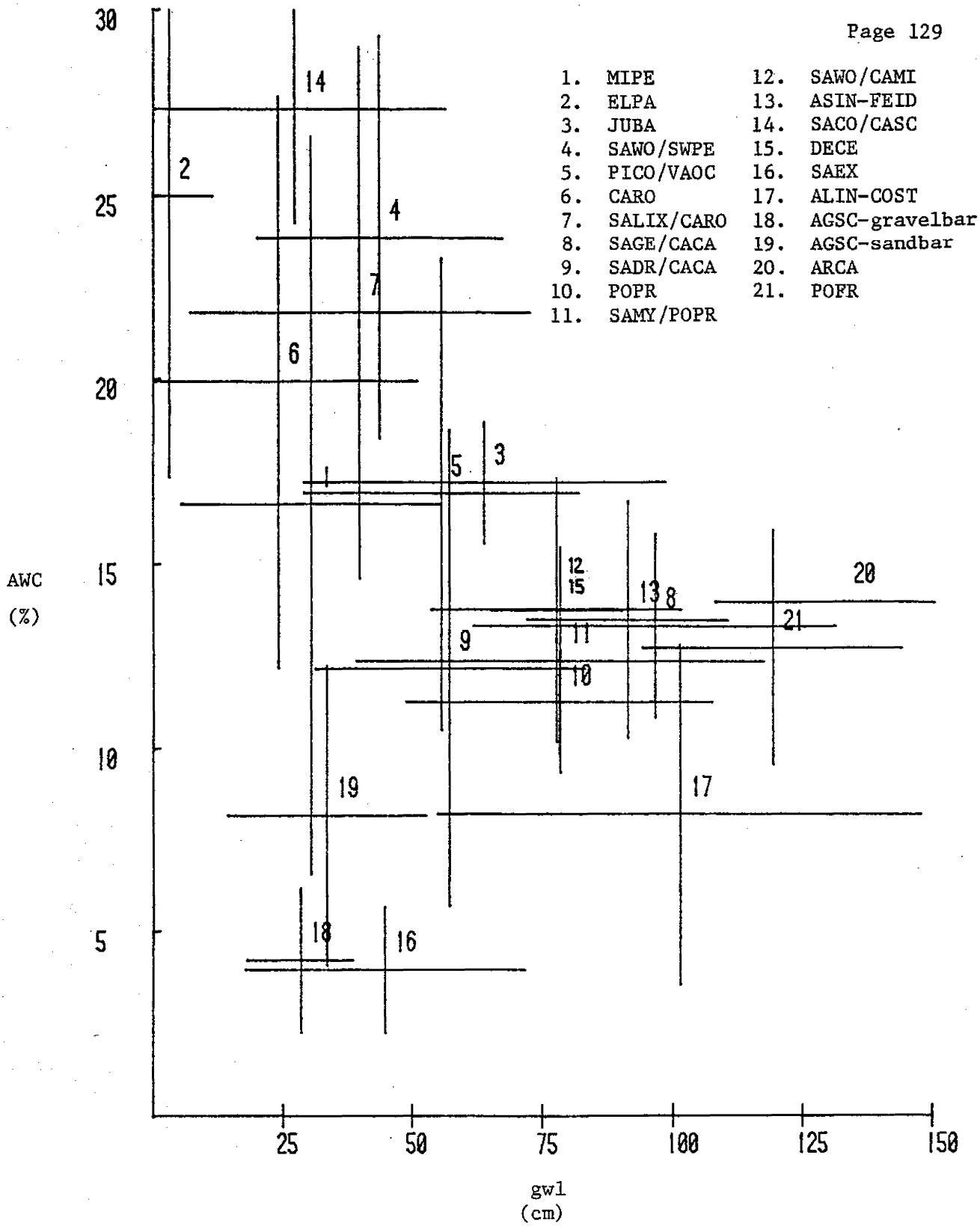

Figure 27. Clustering of community types relative to gwl and AWC.

Community Patterns

Among all sites characterized by a given shrub stratum, there may be several distinct understory strata. Similarly, a single understory stratum may occur beneath several different overstory strata. Such is the situation described by Norton et al. (1981) for the Greys River drainage, Wyoming; their taxa occupy slots in a two-dimensional array of overstory and understory "groups".

The situation is not so "tidy" in the upper Salmon/Middle Fork area. Understory and overstory are not as independent; there are more one-to-one shrub/herbaceous relationships. Several community types have unique overstory or understory strata.

Riparian communities often occur in spatial associations, which are usually distinctive of geomorphology. Major geomorphological types observed in the study area are:

1. bogs;
2. broad meadows;
3. areas affected by beaver activity;
4. narrow V-canyons.

Spatial associations are discussed below for each geomorphological type.

Bogs are predominantly found in the western and northern portions of the study area at middle to upper elevations. A typical bog system is illustrated in Figure 28.

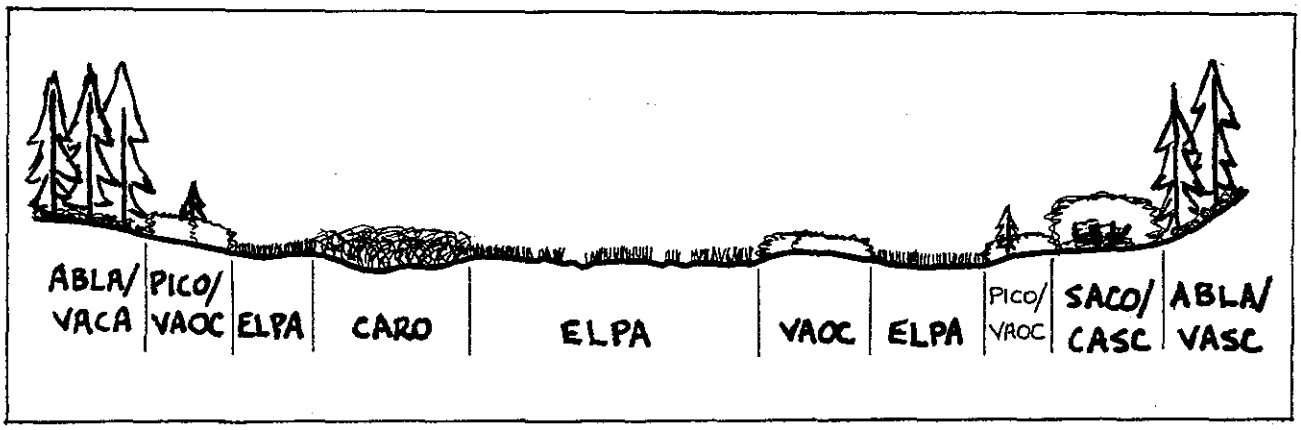

Figure 28. Communities common in and around bogs.

The majority of the bog is dominated by ELPA communities. Drainage is dispersed in many small rivulets; soils are usually saturated to the surface. Carex rostrata and/or Carex aquatilis may fill small concavities and border rivulets. Vaccinium occidentale is often dominant on small mossy hummocks within the bog, and PICO/VAOC communities are commonly marginal on the transition to upland habitats. SACO/CASC stands were also observed on bog peripheries. Adjacent upland units are frequently of ABLA/VACA and ABLA/VASC hts.

Broad valley systems are well-developed in Stanley Basin and Bear Valley. A schematic of these systems is depicted in Figure 29.

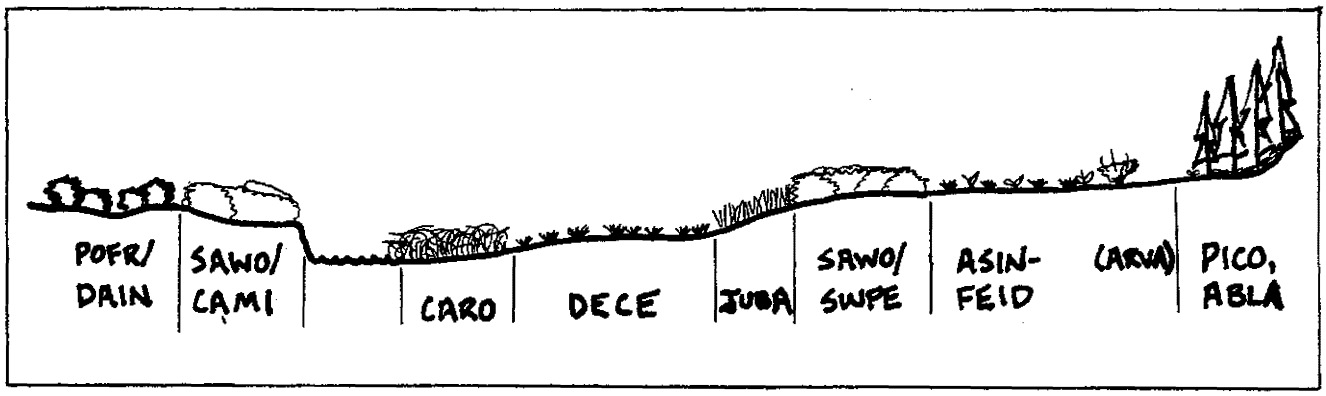

Figure 29. Communities common in broad meadows.

CARO communities generally occupy low microsites where streambanks are gradual, or where there is no definite central channel. Broad areas dominated by Deschampsia cespitosa, often mingled with Juncus balticus or Salix spp., lead to seepy terrace brows characterized by JUBA or SAWO/SWPE communities. Sideslopes may be dry, barely riparian or upland benches with ASIN-FEID and/or ARVA/FEID communities.

Where streambanks rise abruptly, various SAWO/CAMI or DECE communities may dominate streamside positions to several tens of meters distant. POPR/DAIN stands are restricted to drier habitats, often surrounding small, ephemeral washes.

Areas affected by beaver activity are distributed throughout the middle and upper elevations of the study area. Typical spatial associations are presented in Figure 30.

Carex rostrata usually lines pond edges and can grow in standing water 3 dm or more deep. Various Salix spp. may grow somewhat above the water levels; sites farther from the pond support drier understories though shrub coverage may be continuous. Alternatively, the marshy CARO

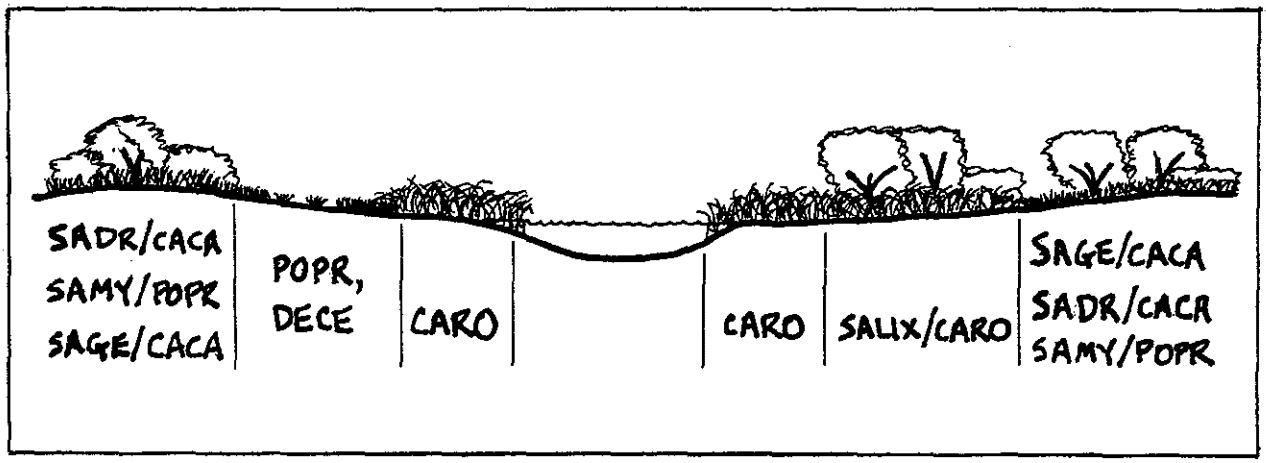

Figure 30. Communities commonly associated with beaver ponds.

sward may grade into drier herbaceous communities or adjacent sites may support various shrubs above a similar understory stratum.

Narrow V-canyons occur in the lower portions of Salmon and Middle Fork Salmon Rivers and their tributaries. A schematic of these systems is presented in Figure 31.

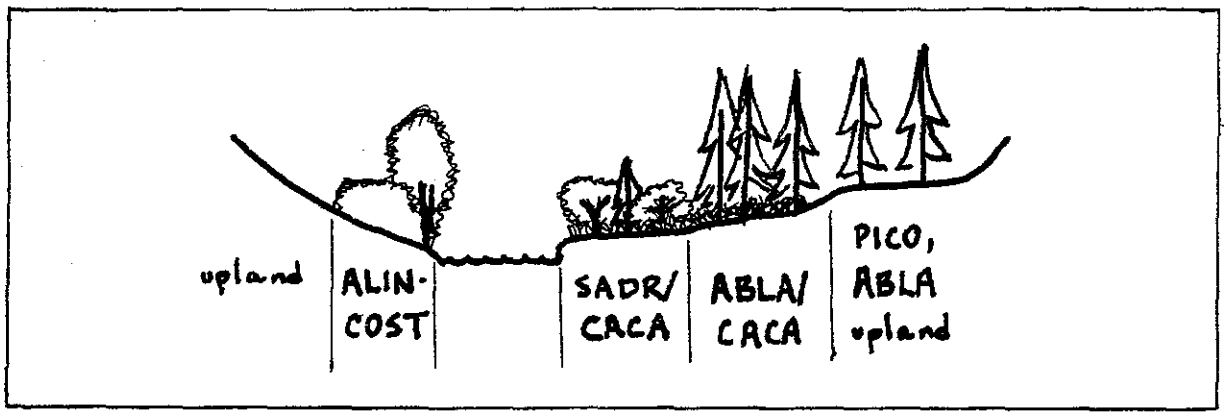

Figure 31. Communities of narrow V-canyons.

ALIN-COST communities usually line streambanks. SADR/CACA stands may dominate on somewhat wider floodplains. In other locations, SADR/CACA, SAMY/PUPR and/or climax ABLA/CACA communities are predominant.

Successional Trends

Diagrams in preceeding sections depict spatial relationships. In some cases, communities adjacent in space may also be adjacent along successional paths through time. Communities reflect the processes inherent to systems as do soil and hydrologic states. Successional inferences are developed from observations of community patterns and analysis of system processes and resultant states. Successional trends are discussed with respect to each of the four major geomorphological types.

Inferred successional and regressional trends for bog ecosystems are presented in Figure 32.

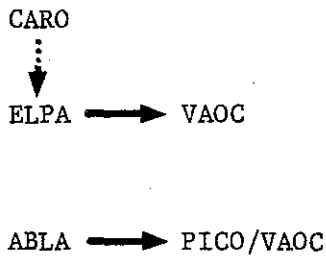

Figure 32. Trends for bog communities.

Inferred trends are both progressive succession (toward drier communities from ELPA) and retrogression (ABLA to PICO/VAOC). The process whereby ELPA develops toward VAOC is predominantly OM accretion above the gwl. VAOC was often noted in microsites on hummocks surrounded by an ELPA community. CARO communities may precede ELPA communities in concave postions and adjacent to rivulets where substrates are coarse mineral material. As bogs develop through vertical accretion of OM, ABLA habitats may be inundated and begin regressing to PICO/VAOC communities.

Successional inferences for broad-valley systems are presented in Figure 33.

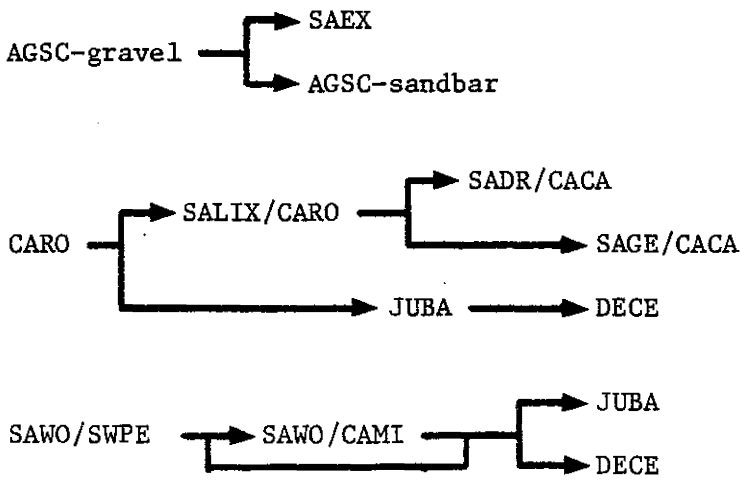

Figure 33. Successional trends for broad-valley communities.

AGSC-gravelbars are both the beginning point of succession and the limit of regression. SAEX communities may succeed in positions not receiving fine-grained alluvium. Gravelbars may develop to sandbars following a single depositional event. Subsequent sedimentation may result in oscillation between sandbars and CARO communities until surfaces are developed above flood levels. This alternating succession/regression was apparent in soil profiles.

The most likely successors of CARO communities, given gradual changes in state, are SALIX/CARO communities. The process corresponding to this transition is increased OM proliferation above the gwl. Further trends to more mesic SADR/CACA and/or SAGE/CACA communities are concurrent with OM mineralization and mineral sedimentation. Drastic changes in hydrologic states of CARO communities may result in direct succession to JUBA and DECE herbaceous communities.

SAWO/SWPE communities are common on seepy toeslopes. Changes in drainage configurations may result in rapid mineralization of organic horizons and succession to SAWO/CAMI or JUBA communities. SAWO/CAMI communities were infrequently observed and may represent ephemeral transitions. Subsequent mineralization of OM and sedimentation in JUBA communities may induce succession to more mesic communities.

Several community types noted in broad-valley ecosystems are not presented in Figure 33. Introduced Poa pratensis may outcompete Deschampsia in herbaceous communities. System parameters of POPR and DECE communities described are nearly identical. Soils of SAMY/POPR communities are simi-

lar to those of SADR/CACA and SAGE/CACA communities. Again, the Poa may be outcompeting the hardy Calamagrostis. ASIN-FEID and ARCA communities seem more closely related to uplands than to riparian systems.

Hypothesized successional relations for communities affected by beaver activity are presented in Figure 34.

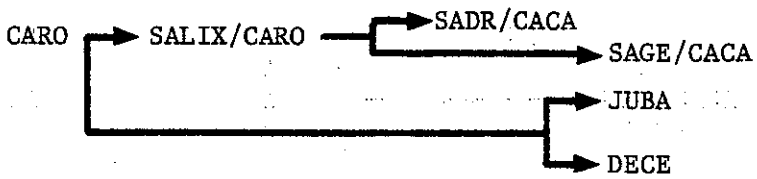

Figure 34. Successional trends for communities commonly associated with beaver activity.

Arrows are directed toward successively drier habitats, generally away from ponds. Regression may follow a similar reverse path from the conception of inundated conditions, although herbaceous communities probably regress directly to herbaceous CARO communities.

Successional inferences for communities common to narrow V-canyons are presented in Figure 35.

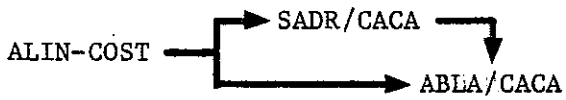

Figure 35. Successional trends for narrow V-canyon communities.

Arrows are in a direction of increasing fine-grained sedimentation. ALIN-COST communities are the extreme case of coarse fluvial and colluvial erosion/deposition. Narrow flats where finer sediments may collect generally grade outward from a narrow fringe of ALIN-COST to SADR/CACA and/or ABLA/CACA.

Disturbance and Management

Fluventic erosion/sedimentation is the principal disturbance in riparian ecosystems. The process is most obvious in positions adjacent to stream channels but effects were noted to the edge of upland systems in the form of small dispersed channels and, to a very limited degree, sheet erosion. The degree of erosion/sedimentation is controlled by the vigor and composition of herbaceous and shrub strata.

Other disturbances noted in the study area are the results of road construction, gravel excavation and mining operations. Witnessing the disturbance along the Yankee Fork, resulting from dredging operations earlier in this century, leads to the defining of a new relative disturbance class (%$#* disturbed).

The most common degradation of riparian systems in the study area results from livestock grazing. Degradation associated with sheep is generally confined to corridors bordering upland communities, areas of long-term concentration and at stream crossings. Effects of cattle are most apparent near stream channels and become more subtle in directions perpendicular to streamflow.

Sheep deplete herbaceous and shrub growth and disturb surfaces through trampling. Resultant impacts include increased channeling and sheet erosion of more mesic systems. Areas of long-term, high density concentration, such as the Pole Creek Meadow, display high levels of disturbance.

Soils of portions of Pole Creek Meadow are referrable to those of Salix communities. Willow stems were noted in surface horizons. Channel erosion and subsequent drainage, and continued browsing of shrub species have been the apparent factor in change to more mesic herbaceous communities.

Effects are less severe where sheep concentrations are short in duration. Effects will be minimized if grazing is deferred until mid-summer when runoff potentials are lowest. Generally, impacts of well-managed sheep grazing upon sedimentation and degradation of stream systems are of low potential.

Cattle utilize streamside positions to a greater extent than do sheep. Effects are characterized by enlargement of corridors through shrub strata, channeling of runoff, and streambank sloughing.

Shrubs of moderate and heavily grazed communities exhibit a characteristic "umbrella" shape with dead outer branches. Corridors through shrub communities develop concave surfaces. Where herbaceous vegetation in corridors is reduced through repeated grazing, channel erosion may result. Streambank sloughing is a principal effect from cattle grazing upon

stream systems. The effect is most severe where adjacent communities are drier herbaceous communities (DECE, POPR cts). Narrow CARU communities bordering streams are an indication of previous disturbance. These communities are also susceptible to sloughing, especially at the interface between fibrous, mat-like root systems and coarse-textured mineral horizons of contiguous communities. Cattle grazing may result in moderate to high levels of degradation to fish habitat.

Reclamation of highly-disturbed streamside positions may be warranted. Subsequent discussion is directed toward methods which may accelerate regeneration of such positions to more stable systems.

The result of severe disturbance to streamside locations is generally an increased frequency and expanse of AGSC-streambar communities. Where processes are predominantly erosional, gravelbars develop; where depositional processes are codominant, sandbars are common. Dominating processes are primarily functions of position relative to stream geometry and the resultant magnitude of fluvial energy affecting the systems.

Gravelbars support sparse vegetation of very low vigor; vegetation has little or no affect upon stabilization. Sandbars often support moderate densities of Carex spp. which constitute a deterrent to fluvial erosional processes. CARU communities develop spontaneously and rapidly. Fibrous root and rhizomes of Carex rostrata are excellent sediment traps for fine-grained alluvium. Stabilization and fine-grained sedimentation are necessary precursors to shrub communities.

Although herbaceous CARU communities are deterrents to lateral forces of stream erosion, they are susceptible to sloughing under moderate weights. Sloughing is predominantly at the interface between fibrous root systems of Carex spp. and adjacent or subtending coarse mineral horizons. Roots of Salix spp. bind Carex mats to mineral substrates and reduce potentials of slougning.

The principal problem of reclaiming disturbed areas is in creating conditions favorable to deposition rather than erosion. Erosional/depositional processes are functions of the competence of streamflow, which predominantly depends upon flow velocity.

The engineering habits of beaver have appreciable effects upon streamflow velocity and competence. Fostering of habitat conditions favorable to beaver, upstream or within areas to be reclaimed, may be a reasonable management option. Artificial obstructions to reduce stream velocities may also be considered. An initial response to such procedures will be increased fine grained sedimentation of both streamside positions and streambottoms (a detrimental effect on fish habitat). As streamside communities become more developed and equilibrium states are approached, sediment flux to adjacent and downstream sites will decrease.

Reclamation of disturbed riparian systems cannot be expected to proceed under conditions from which disturbance resulted. The most obvious management option to reduce degradation of stream systems and fish habitat is to eliminate cattle grazing of sites most susceptible to disturbance. The most susceptible sites are herbaceous communities in broad valley systems (POPR, DECE cts). Unfortunately, these sites are among the most productive in terms of palatable forage species. Another option is to limit access by fencing areas highly susceptible to bank sloughing. Consideration of this final option requires financial analysis beyond the scope of this study.

Comparison With Other Riparian Classifications

This classification has simplified units of the Sawtooth Valley classification developed by Tuhy (1981). The current system has fewer units due to several combinations; nomenclature is also somewhat simpler. Different species are used to name some types that are otherwise identical in both classifications. This classification also contains some units undescribed for the Sawtooth Valley.

Similarites exist between some units and riparian types described by Norton et al. (1981) in western Wyoming, and Padgett (1981) in eastern Oregon. Comparisons with other riparian classifications are in Figure 36.

Salmon/Middle Fork Tuhy and Jensen 1982	Sawtooth Valley Tuhy 1981	Greys River Norton et al. 1981	Eastern Oregon Padgett 1981
CARO	CARO-CAAQ	CARO	CARO
			CAAQ
	CABU-CASA		
ELPA	SCCE-CALI		
JUBA	JUBA-MUFI		JUBA
DECE	POPR (in part)	POPR (in part)	
POPR	POPR (most)	POPR (most)	POPR
	POFR/POPR (in part)		
		MECI	
AGSC-bar	AGEX-AGSC		
ASIN-FEID	ASIN-FEID		
	BROMUS-STOC		
PICO/VAOC	PICO/VAOC		
SAWO/SWPE	SAWO/SWPE	SAWO/SWPE	
	BEGL/LOCA/SEPS(in part)		
SAWO/CAMI		SAWO/POPR	
POFR/DAIN	POFR/DAIN	POFR present	
	POFR/POPR (most)		
incidental ARCA	ARCA/FEID	ARCA present	ARCA
SALIX/CARO	SALIX/CARO-CAAQ	SAWO/CARO	
		SABO/CARO	
SACO/CASC			
SADR/CACA	SADR/RILA/THOC (most)	SABO/POPR (in part)	
	BEGL/LOCA/SEPS(in part)		
incidental MIPE	SADR/RILA/THOC(in part)	SABO/MIPE	
SAMY/POPR	SADR/RILA/THOC(in part)	SABO/POPR (most)	
		SABO/MECI	
SAGE/CACA	SAGE/GEMA		SAGE meadow
			SAGE stream
	BEGL/LOCA/SEPS(in part)		
			SARIM
			SALE
incidental SAEX		SAEX/POPR	SAEXE
ALIN-COST		COST/GATRIFL	ALIN
ABLA/CACA	ABLA/CACA		
	PICO/CACA-THOC		
ABLA/STAM	ABLA/STAM		
incidental PIEN/EQAR	incidental PIEN/EQAR	PICEA/EQAR	
		PICEA/GATRIFL	
incidental POTRI		incidental POAN	
	POTREM/CAGE		POTREM-moist
			POTREM-xeric

Figure 36. Comparison of riparian classifications.

Comparison With Wetlands Classification

The Upper Salmon/Middle Fork riparian classification as it fits in the National Wetlands Classification developed by the US Fish and Wildlife Service (Cowardin et al., 1979) is presented in Figure 37.

Palustrine System

1. Forested Wetland Class

   A) Needle-leaved Evergreen Subclass

      a) Abies lasiocarpa/Calamagrostis canadensis ht
      b) Abies lasiocarpa/Streptopus amplexifolius ht
      c) Pinus contorta/Vaccinium occidentale ct

2. Scrub-Shrub Wetland Class

   A) Broad-leaved Deciduous Subclass

      a) Alnus incana-Cornus stolonifera ct
      b) Potentilla fruticosa/Danthonia intermedia ct
      c) Salix spp./Carex rostrata ct
      d) Salix commutata/Carex scopulorum ct
      e) Salix drummondiana/Calamagrostis canadensis ct
      f) Salix geyeriana/Calamagrostis canadensis ct
      g) Salix myrtillifolia/Poa pratensis ct
      h) Salix wolfii/Carex microptera ct
      i) Salix wolfii/Swertia perennis ct

3. Herbaceous (or Emergent) Wetland Class

   A) No Subclass (all are persistent)

      a) Agrostis scabra-streambar ct
      b) Aster integrifolius-Festuca idahoensis ct
      c) Carex rostrata ct
      d) Deschampsia cespitosa ct
      e) Eleocharis pauciflora ct
      f) Juncus balticus ct
      g) Poa pratensis ct

Figure 37. Units of the Salmon/Middle Fork riparian classification placed in the National Wetlands Classification.

Frequency Versus Cover

A method of nested frequency analysis was tested in conjunction with this study. The following comments are the judgements of these scientists of the value of frequency as a classification tool.

Constructing a classification from a series of releves requires collection of information relevant for clustering. Floristic grouping requires complete species lists plus a quantitative value for each species of the community. Poore (1955b) lists three prerequisites for a species role parameter:

1. It must be applicable to any type of vegetation.

2. It must be sufficiently accurate for the required purposes.

3. It must be rapid.

There is a tradeoff between accuracy and rapidity. Mueller-Dombois and Ellenberg (1974) believe that for classification purposes, it is more useful to analyze a greater number of samples with less detail than to analyze few in great detail.

Frequency is percentage occurrence of species among a series of microplots within a community. It is a quantitative analytical parameter with little or no subjectivity involved in its determination.

Frequency is a non-absolute measure; data must be reported in relation to size and shape of a sampling frame (or point). Different plot sizes are suited to different plant growth habits; nested frequency combines multiple plot sizes in one frame.

Ten nested frequency measurements were conducted by these scientists for each of three communities per type. Greig-Smith (1964) believes that twenty plot placements of any kind are too few for almost any community analysis. The Region IV Range Analysis Handbook suggests 80-100 nested frequency replicates per stand for trend analysis. Large numbers of frequency plots, if such can be fit into small riparian stands, decrease rapidity of sampling, especially in species-rich meadows. The aggregate species list from frequency sampling seldom includes all species in the community, so a releve is still required.

The ultimate utility of a classification is determined by the ease by which field personnel can use and understand it. Frequency data, influenced by growth habit and dispersion, give little indication of cover. Cover is easier to "see" than frequency.

Percent coverage, a quantitative analytical parameter, is absolute and not dependent on plot size. Unlike frequency, all life forms may be compared on a common basis. Alternative methods of cover determination are available which may be utilized to calibrate ocular estimates. Accuracy of estimation was augmented by these workers by daily calibration using 2 X 5 dm microplots marked into fractional portions.

Reconnaissance of South Fork Salmon River Drainage

A reconnaissance of the South Fork Salmon River and several of its tributaries was conducted. The applicability of the upper Salmon/Middle Fork classification (Salmon classification) was tested in these watersheds.

Upper elevations and headwater reaches are largely forested. Riparian zones are dominated by wet-site herbs. ABLA/CACA, ABLA/STAM and ABLA/CABI hts are identifiable where trees grow. Herbaceous areas do not strictly match previously-described units, but are identifiable in terms of them: Small wet meadows with Carex scopulorum, Pedicularis groenlandica, Ligusticum canbyi, Dodecatheon jeffreyi and/or Caltha biflora suggest a SACO/CASC-type understory with affinities to the above habitat types. Other small meadows seem to be hybrids of the DECE ct and wet-herb types. Seepy areas topped by Salix monticola and Alnus spp. are similar to incidental MIPE communities of the Salmon classification. Sites near Deadwood Summit support SACO/CASC and CARO communities, while areas near Monumental Summit match ABLA/LEGL ht and SADR/CACA ct descriptions.

Broad, open valleys at middle to upper elevations are like those of the Salmon study area. Stolle Meadows, Tyndall Meadows and bottoms near Landmark support many communities nearly identical to those of the Salmon classification; other communities are identifiable as hybrids of Salmon classification units.

The existing riparian and forest classifcations are essentially applicable to the southern, higher-elevation portion of the South Fork Salmon River watershed. Some species common in the reconnaissance zone were observed only infrequently in western and northern portions of the Salmon study area. Among these are Sanguisorba sitchensis, Lupinus polyphyllus, Ligusticum canbyi and Caltha biflora. Though not obvious, such consistent minor floristic differences require attention in the expansion of a riparian classification throughout the region. These species indicate some environmental variation within widespread communities which share the same dominants.

The majority of the South Fork Salmon River and its major tributaries flow through narrow, steep-sided V-canyons. What little riparian habitat there is exists on streambank fringes, small flats and streambars.

The discontinuous streambank fringes are shrubby, mostly dominated by Alnus spp.; both A. incana and A. sinuata were observed. Variable understories are largely comprised of wet-site herbs. Cornus stolonifera is also common; in many locations the fringe is of the ALIN-COST ct. At lower elevations, several shrubs and small trees absent or uncommon in the Salmon study area become codominant. These include Crataegus douglasii, Betula occidentalis, Philadelphus lewisii, Salix scouleriana and Symphoricarpos albus. Similar shrubby assemblages have been observed by these authors elsewhere in the West. These are well-developed at elevations just below the lower limits of the Greys River and Salmon study areas.

Small streamside flats in the canyon bottoms support various communities. ALIN-COST and SADR/CACA stands were observed. Mature Picea and Abies lasiocarpa grow above low-density shrub strata comprised of the above-mentioned fringe species. Other small floodplains support communities unlike any in the Salmon study area: Clumps of tall shrubs (Alnus, Cornus, Crataegus, Salix scouleriana) are scattered within large herbaceous areas. These are dominated by Calamagrostis canadensis and also include Solidago canadensis, Carex amplifolia, Heracleum lanatum and Cicuta douglasii.

Canyon-bottom streambars are not unlike some in the Salmon study area, with Agrostis scabra, Agrostis exarata, Carex lenticularis, Salix exigua ssp. melanopsis and others.

The fringes, floodplains and streambars mentioned above occur along larger streams and rivers. Tributary to these are a number of small, steep gullies choked with Alnus (probably A. sinuata), Salix scouleriana and other shrubs. Similar situations are poorly developed and undescribed in the Salmon study area.

The reconnaissance was conducted to just below the junction of the Secesh and South Fork Salmon Rivers, at Hamilton Creek. The lower thirty miles or so of the South Fork, to the Salmon River junction near Mackay Bar, is roadless and was not investigated. However, the work of Horton (1972) and especially Miller (1976) includes riparian communities found along the lower South Fork. Here Alnus rhombifolia and Celtis reticulata are near their upper limits, but may be locally important in shrub communities. Many shrubby and herbaceous associates of these lower South Fork communities are absent farther upstream.

In summary, the narrow-canyon riparian zones of the South Fork Salmon River watershed are not adequately described by this classification. However, the diversity warrants only small-scale investigation with sampling and analysis.

Sampling methods utilized for the Salmon classification may not be applicable to narrow shrub fringes. The method devised by Miller (1976)

seems better applied to smaller streams and steep draws; he measured variable- length transects at set intervals along the stream. Some combination of the methods of Miller and those of the Salmon classification may be most versatile for the area.

CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. A comprehensive community type classification for riparian ecosystems of the upper Salmon/Middle Fork Salmon Rivers is presented. The classification consists of a key, descriptions of plant/soil/environment characteristics and synthesis tables of types.

2. Plant-soil-environment relationships have been described for each community type delineated. Relationships were also described for riparian systems comprised of multiple communities.

3. Processes inherent to communities were determined from observations of soil morphology. Spatial and geographical relationships were also determined. Inferences of successional trends were fabricated from inherent processes and spatial relationships among communities.

4. Community types derived for the study area were collated with classifications developed by Tuhy (1981) in the Sawtooth Valley, Norton et al. (1981) in western Wyoming, and Padgett (1981) in eastern Oregon.

5. Implications with respect to management are discussed for each community type and for the riparian zone as a whole. Management discussions are based on tabulated observations.

6. A reconnaissance of the South Fork Salmon River watershed was conducted. This classification was found to apply adequately in upper reaches. Lower, narrow canyons do not fit this system well.

Recommendations

Three permanent reference plots were established for each major community type. Reference plots are those for which frequency and herbage production measurements were conducted. Accurate bearings of transect lines relative to a steel rod were recorded. Generally, plots for which frequency and production were measured are typical of corresponding com-

munity types, and may serve as references for trend analysis.

Riparian ecosystems were grouped into areas of similar geomorphologic postions, each with a distinct set of processes affecting resulting states of the systems. Some areas identified for controlled scientific investigation of management effects for each geomorphologic type are:

1. Bogs in Mays Creek just upstream from the Salmon River junction.

2. Broad open meadows along Marsh Creek, or those in and surrounding Bear Valley.

3. Areas affected by beavers along Stanley, Champion, Pole and Beaver Creeks (Sawtooth NRA) and Beaver Creek (Challis NF).

4. Lower V-canyons along the Middle Fork Salmon River, and somewhat higher canyons of Bench, Banner and Cape Horn Creeks.

These sites are candidates for Research Natural Area status.

Taxonomic units of this classification are perhaps more finite than is applicable to a management perspective. The philosophy of the authors is to describe the finite and consolidate based on observations. For management purposes, units may be grouped in terms of similarity of inherent states. These groups may also be used for inventory and mapping purposes.

Nested frequency analysis was applied to riparian communities. Although of great potential in trend analysis, as a classification tool the method is rather cumbersome. Frequency measurement should be integrated with baseline ecosystem research but should not be substituted for cover as the principal classification parameter.

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APPENDIX A

PLANT SPECIES ABBREVIATIONS

TREES

ABIE LA O ABIES LASIOCARPA OVERSTORY
ABIE LA R ABIES LASIOCARPA REGENERATION
PICE EN O PICEA ENGELMANNII OVERSTORY
PICE EN R PICEA ENGELMANNII REGENERATION
PINU CO O PINUS CONTORTA OVERSTORY
PINU CO R PINUS CONTORTA REGENERATION

SHRUBS

ALNU INCA ALNUS INCANA
AMEL ALNI AMELANCHIER ALNIFOLIA
ARTM CANA ARTEMISIA CANA SSP. VISCIDULA
BETU GLAN BETULA GLANDULOSA
CORN STOL CORNUS STOLONIFERA
LEDU GLAN LEDUM GLANDULOSUM
LONI CAER LONICERA CAERULEA
LONI INVO LONICERA INVOLUCRATA
POTE FRUT POTENTILLA FRUTICOSA
RIBE LACU RIBES LACUSTRE
RIBE HUDS RIBES HUDSONIANUM
ROSA WOOD ROSA WOODSII
SALX COMM SALIX COMMUTATA
SALX DRUM SALIX DRUMMONDIANA
SALX EXEX SALIX EXIGUA SSP. EXIGUA
SALX EXME SALIX EXIGUA SSP. MELANOPSIS
SALX GEYR SALIX GEYERIANA
SALX MONT SALIX MONTICOLA
SALX MYRT SALIX MYRTILLIFOLIA
SALX PHYL SALIX PHYLICIFOLIA VAR. MONICA
SALX WOID SALIX WOLFII VAR. IDAHOENSIS
SHEP CANA SHEPHERDIA CANADENSIS
VACC CAES VACCINIUM CAESPITOSUM
VACC OCCI VACCINIUM OCCIDENTALE

GRAMINOIDS

AGRP CANI AGROPYRON CANINUM
AGRS EXAR AGROSTIS EXARATA
AGRS IDAH AGROSTIS IDAHOENSIS
AGRS SCAB AGROSTIS SCABRA
ALOP AEQU ALOPECURUS AEQUALIS
BROM CARI BROMUS CARINATUS
BROM CILI BROMUS CILIATUS
CALA CANA CALAMAGROSTIS CANADENSIS
CARX AQUA CAREX AQUATILIS
CARX ATHR CAREX ATHROSTACHYA
CARX BUXB CAREX BUXBAUMII
CARX CANE CAREX CANESCENS
CARX CUSI CAREX CUSICKII
CARX DIOI CAREX DIOICA
CARX DISP CAREX DISPERMA
CARX JONE CAREX JONESII
CARX LANU CAREX LANUGINOSA
CARX LENT CAREX LENTICULARIS
CARX LIVI CAREX LIVIDA
CARX LUZU CAREX LUZULINA
CARX MICR CAREX MICROPTERA
CARX MURI CAREX MURICATA
CARX PRAE CAREX PRAEGRACILIS
CARX PRAT CAREX PRATICOLA
CARX ROST CAREX ROSTRATA
CARX SAXA CAREX SAXATILIS
CARX SCOP CAREX SCOPULORUM
CARX SIMU CAREX SIMULATA
DANT INTE DANTHONIA INTERMEDIA
DESC CESP DESCHAMPSIA CESPITOSA
ELEO PAUC ELEOCHARIS PAUCIFLORA
ELYM GLAU ELYMUS GLAUCUS
FEST IDAH FESTUCA IDAHOENSIS
GLYC ELAT GLYCERIA ELATA
GLYC STRI GLYCERIA STRIATA
HORD BRAC HORDEUM BRACHYANTHERUM
JUNC BA/L JUNCUS BALTICUS/(LATERAL)
KOEL CRIS KOELERIA CRISTATA
LUZU CAMP LUZULA CAMPESTRIS
LUZU PARV LUZULA PARVIFLORA
MELI SPEC MELICA SPECTABILIS
MUHL FILI MUHLENBERGIA FILIFORMIS
PHLE ALPI PHLEUM ALPINUM
POA LEPT POA LEPTOCOMA
POA NEVA POA NEVADENSIS
POA PALU POA PALUSTRIS
POA PRAT POA PRATENSIS
PUCC PAUC PUCCINELLIA PAUCIFLORA
SCIR CESP SCIRPUS CESPITOSUS
STIP OCCI STIPA OCCIDENTALIS VAR. MINOR
TRIS WOLF TRISETUM WOLFII

FORBS

ACHI MILL ACHILLEA MILLEFOLIUM
ACON COLU ACONITUM COLUMBIANUM
AGOS GLAU AGOSERIS GLAUCA
ANGL ARGU ANGELICA ARGUTA
ANTE CORY ANTENNARIA CORYMBOSA
ANTE MICR ANTENNARIA MICROPHYLLA
ARNI AMPL ARNICA AMPLEXICAULIS
ARNI CHAM ARNICA CHAMISSONIS
ARTM LUDO ARTEMISIA LUDOVICIANA
ASTE FOLI ASTER FOLIACEUS
ASTE INTG ASTER INTEGRIFOLIUS
ASTE MODE ASTER MODESTUS
ASTE OCCI ASTER OCCIDENTALIS
ASTR ALPI ASTRAGALUS ALPINUS
CALT BIFL CALTHA BIFLORA
CALT LEPT CALTHA LEPTOSEPALA
CAST CUSI CASTILLEJA CUSICKII
CAST MINI CASTILLEJA MINIATA
CIRS IUM CIRSIUM SPP.
DODE JEFF DODECATHEON JEFFREYI
DROS ANGL DROSERA ANGLICA
EPIL ANGU EPILOBIUM ANGUSTIFOLIUM
EPIL GLAN EPILOBIUM GLANDULOSUM
EQUI ARVE EQUISETUM ARVENSE
ERIG COUL ERIGERON COULTERI
ERIG PERE ERIGERON PEREGRINUS
FRAG VIRG FRAGARIA VIRGINIANA
GALI TRFI GALIUM TRIFIDUM
GALI TRFL GALIUM TRIFLORUM
GENT AFFI GENTIANA AFFINIS
GEUM MACR GEUM MACROPHYLLUM
GEUM TRIF GEUM TRIFLORUM
HORK FUSC HORKELIA FUSCA
LIGU TENU LIGUSTICUM TENUIFOLIUM
LINA HARK LINANTHUS HARKNESSII
MERT CILI MERTENSIA CILIATA
MIMU GUTT MIMULUS GUTTATUS
MIMU PRIM MIMULUS PRIMULOIDES
MITE PENT MITELLA PENTANDRA
PARN FIMB PARNASSIA FIMBRIATA
PEDI GROE PEDICULARIS GROENLANDICA
PENS GLOB PENSTEMON GLOBOSUS
POLE OCCI POLEMONIUM OCCIDENTALE
POLY BIST POLYGONUM BISTORTOIDES
POLY DOUG POLYGONUM DOUGLASII
POTE DIVE POTENTILLA DIVERSIFOLIA
POTE GRAC POTENTILLA GRACILIS
PYRL ASAR PYROLA ASARIFOLIA
RANU ACRI RANUNCULUS ACRIFORMIS
RANU ALIS RANUNCULUS ALISMAEFOLIUS
SAGI NA SAGINA SP.
SAXI ARGU SAXIFRAGA ARGUTA
SAXI OREG SAXIFRAGA OREGANA
SELA SELA SELAGINELLA SELAGINOIDES
SENE CYMB SENECIO CYMBALARIOIDES
SENE INTE SENECIO INTEGERRIMUS
SENE PSEU SENECIO PSEUDAUREUS
SENE SPHA SENECIO SPHAEROCEPHALUS
SENE TRIA SENECIO TRIANGULARIS
SMIL STEL SMILACINA STELLATA
SOLI CANA SOLIDAGO CANADENSIS
STEL LONG STELLARIA LONGIPES
SWER PERE SWERTIA PERENNIS
TARX OFFI TARAXACUM OFFICINALE
THAL ALPI THALICTRUM ALPINUM
THAL OCCI THALICTRUM OCCIDENTALE
TRIF LONG TRIFOLIUM LONGIPES
URTI DIOC URTICA DIOICA
VALE EDUL VALERIANA EDULIS
VERO AMER VERONICA AMERICANA
VERO WORM VERONICA WORMSKJOLDII
VIOL NEPH VIOLA NEPHROPHYLLA

APPENDIX B

CONSTANCY AND AVERAGE COVERAGE OF INDICATOR SPECIES

(Average coverage is in parentheses)

# OF STANDS	CARO 13	ELPA 9	JUBA 5	DECE 9	POPR 8	AGSC-BAR 13	ASIN-FEID 6
TREES							
ABIE LA O	(0)	(0)	(0)	(0)	(0)	(0)	(0)
ABIE LA R	(0)	(0)	(0)	(0)	(0)	(0)	(0)
PICE EN O	(0)	(0)	(0)	(0)	(0)	(0)	(0)
PICE EN R	(0)	(0)	(0)	1(**)	(0)	2(**)	(0)
PINU CO O	1(38)	(0)	(0)	(0)	(0)	(0)	(0)
PINU CO R	1(3)	3(**)	(0)	(0)	(0)	5(1)	(0)
SHRUBS							
ALNU INCA	1(**)	(0)	(0)	(0)	(0)	2(**)	(0)
BETU GLAN	(0)	1(3)	(0)	(0)	(0)	1(**)	(0)
CORN STOL	(0)	(0)	(0)	(0)	(0)	(0)	(0)
LEDU GLAN	(0)	(0)	(0)	(0)	(0)	(0)	(0)
LONI CAER	2(2)	4(1)	(0)	(0)	(0)	2(**)	(0)
LONI INVO	1(3)	(0)	(0)	(0)	(0)	(0)	(0)
POTE FRUT	(0)	4(**)	2(3)	1(3)	1(3)	3(1)	(0)
RIBE LACU	(0)	(0)	(0)	(0)	(0)	1(**)	(0)
SALX COMM	(0)	1(3)	(0)	(0)	(0)	(0)	(0)
SALX DRUM	(0)	(0)	(0)	(0)	(0)	8(4)	(0)
SALX EXME	(0)	(0)	(0)	(0)	(0)	4(10)	(0)
SALX GEYR	2(2)	(0)	(0)	(0)	1(**)	2(3)	(0)
SALX MONT	(0)	(0)	(0)	(0)	(0)	(0)	(0)
SALX MYRT	1(**)	(0)	(0)	(0)	1(3)	6(2)	(0)
SALX PHYL	5(1)	2(2)	(0)	(0)	(0)	(0)	(0)
SALX WOID	3(1)	1(**)	(0)	(0)	1(**)	2(1)	(0)
VACC OCCI	1(**)	2(**)	(0)	(0)	(0)	1(**)	(0)
GRAMINOIDS							
AGRP CANI	1(**)	(0)	(0)	1(3)	6(2)	5(1)	8(10)
AGRS EXAR	2(**)	(0)	(0)	(0)	(0)	6(3)	(0)
AGRS SCAB	2(**)	(0)	(0)	(0)	4(7)	8(4)	3(3)
ALOP AEQU	(0)	(0)	(0)	(0)	1(3)	4(1)	(0)
BROM CARI	(0)	(0)	(0)	(0)	(0)	1(**)	5(1)
BROM CILI	(0)	(0)	(0)	(0)	5(3)	2(**)	(0)
CALA CANA	4(12)	(0)	(0)	(0)	(0)	2(3)	(0)
CARX AQUA	8(34)	4(2)	4(3)	4(2)	5(13)	3(6)	(0)
CARX ATHR	(0)	(0)	2(63)	(0)	(0)	3(1)	2(20)
CARX BUXB	1(20)	1(20)	(0)	(0)	(0)	(0)	(0)
CARX CUSI	2(3)	2(3)	2(3)	(0)	(0)	(0)	(0)
CARX DIOI	(0)	1(**)	(0)	(0)	(0)	(0)	(0)
CARX JONE	(0)	1(**)	2(3)	3(4)	(0)	2(2)	(0)
CARX LENT	(0)	(0)	(0)	(0)	(0)	4(12)	(0)
CARX LIVI	1(3)	4(11)	(0)	(0)	(0)	(0)	(0)
CARX MICR	3(**)	(0)	4(5)	8(2)	8(20)	5(**)	8(16)
CARX MURI	2(10)	7(4)	(0)	(0)	(0)	1(**)	(0)
CARX ROST	8(55)	6(6)	2(3)	1(**)	1(3)	4(1)	(0)
CARX SAXA	1(20)	(0)	(0)	(0)	(0)	1(3)	(0)
CARX SCOP	(0)	1(38)	(0)	(0)	(0)	1(**)	(0)
CARX SIMU	1(63)	3(15)	6(20)	(0)	(0)	(0)	(0)
DANT INTE	(0)	(0)	(0)	2(2)	(0)	(0)	2(3)
DESC CESP	2(1)	6(3)	10(20)	10(27)	1(**)	4(2)	3(**)
ELEO PAUC	(0)	10(32)	2(3)	3(26)	(0)	1(**)	(0)
FEST IDAH	(0)	(0)	(0)	(0)	(0)	(0)	3(12)
HORD BRAC	2(12)	(0)	8(2)	1(**)	5(4)	2(2)	3(3)
JUNC BA/L	2(2)	3(2)	10(53)	4(1)	6(20)	2(2)	3(2)
KOEL CRIS	(0)	(0)	2(**)	1(**)	(0)	(0)	5(8)
LUZU CAMP	1(**)	(0)	2(3)	6(4)	3(3)	2(1)	2(13)
MUHL FILI	(0)	3(2)	8(14)	6(16)	1(20)	1(**)	(0)
PHLE ALPI	(0)	(0)	4(4)	8(4)	4(2)	6(**)	3(4)
POA NEVA	(0)	(0)	(0)	(0)	(0)	(0)	5(16)
POA PALU	1(3)	(0)	(0)	(0)	1(3)	2(1)	(0)
POA PRAT	5(1)	(0)	6(2)	4(2)	10(32)	2(**)	3(20)
PUCC PAUC	(0)	(0)	(0)	(0)	(0)	3(2)	(0)
SCIR CESP	(0)	2(29)	(0)	(0)	(0)	(0)	(0)
STIP OCHI	(0)	(0)	(0)	1(**)	1(**)	(0)	8(2)
TRIS WOLF	(0)	(0)	2(13)	2(3)	5(3)	1(**)	(0)

** = TRACE COVER; CODE TO CONSTANCY VALUES:
+ = 0-5%, 1 = 5-15%, 2 = 15-25%, 3 = 25-35%, 4 = 35-45%, 5 = 45-55%, 6 = 55-65%, 7 = 65-75%
8 = 75-85%, 9 = 85-95%, 10 = 95-100%

# OF STANDS	CARO 13	ELPA 9	JUBA 5	DECE 9	POPR 8	AGSC-BAR 13	ASIN-FEID 6
FORBS							
ACHI MILL	2(**)	(0)	6(1)	4(8)	8(4)	5(1)	10(3)
ACON COLU	(0)	(0)	(0)	(0)	(0)	(0)	(0)
AGOS GLAU	(0)	(0)	(0)	4(4)	3(**)	(0)	3(2)
ANGL ARGU	(0)	(0)	(0)	(0)	(0)	(0)	(0)
ANTE CORY	(0)	(0)	2(3)	8(6)	3(8)	1(**)	2(38)
ANTE MICR	(0)	(0)	(0)	(0)	3(**)	2(**)	3(4)
ARNI CHAM	2(3)	(0)	(0)	3(2)	6(6)	2(1)	(0)
ARTH LUDO	(0)	(0)	(0)	(0)	(0)	2(**)	(0)
ASTE FOLI	3(1)	2(**)	10(9)	8(4)	9(4)	8(2)	3(3)
ASTE INTG	(0)	(0)	(0)	(0)	(0)	(0)	5(9)
ASTE MODE	(0)	(0)	(0)	(0)	(0)	1(**)	(0)
ASTE OCCI	(0)	(0)	(0)	1(8)	(0)	(0)	(0)
CALT BIFL	(0)	(0)	(0)	(0)	(0)	(0)	(0)
CALT LEPT	(0)	4(2)	(0)	2(**)	(0)	1(**)	(0)
CAST CUSI	(0)	(0)	2(**)	4(6)	1(3)	(0)	3(**)
CIRS IUM	(0)	(0)	(0)	1(**)	3(**)	3(**)	7(1)
DODE JEFF	2(3)	(0)	4(8)	3(15)	(0)	1(**)	(0)
EPIL GLAN	6(4)	(0)	8(**)	3(**)	6(1)	6(1)	2(**)
EQUI ARVE	2(22)	1(**)	(0)	(0)	1(**)	3(17)	(0)
ERIG PERE	(0)	(0)	(0)	1(63)	(0)	(0)	(0)
FRAG VIRG	1(3)	(0)	2(**)	(0)	6(4)	4(1)	7(17)
GALI TRFI	7(2)	(0)	4(3)	(0)	3(2)	2(**)	(0)
GALI TRFL	(0)	(0)	(0)	(0)	(0)	(0)	(0)
GENT AFFI	(0)	(0)	4(4)	3(4)	1(3)	(0)	(0)
GEUM MACR	3(2)	(0)	6(2)	6(**)	8(2)	2(**)	2(**)
GEUM TRIF	(0)	(0)	(0)	(0)	(0)	(0)	7(3)
HORK FUSC	(0)	(0)	(0)	(0)	(0)	(0)	(0)
LIGU TENU	(0)	2(**)	(0)	2(**)	(0)	(0)	(0)
LINA MARK	(0)	(0)	(0)	(0)	(0)	(0)	5(2)
MERT CILI	(0)	(0)	(0)	(0)	(0)	2(**)	(0)
MIMU GUTT	1(38)	(0)	(0)	(0)	(0)	2(1)	(0)
MIMU PRIM	(0)	3(4)	2(**)	2(3)	(0)	2(2)	2(**)
MITE PENT	(0)	(0)	(0)	(0)	(0)	(0)	(0)
PEDI GROE	2(2)	10(2)	2(8)	6(4)	(0)	3(**)	(0)
PENS GLOB	(0)	(0)	6(6)	3(2)	3(3)	1(**)	3(31)
POLE OCCI	3(3)	(0)	2(**)	(0)	4(1)	(0)	(0)
POLY BIST	(0)	1(13)	4(**)	6(3)	(0)	(0)	2(3)
POLY DOUG	(0)	(0)	(0)	1(**)	(0)	(0)	8(1)
POTE DIVE	(0)	(0)	(0)	4(5)	(0)	(0)	(0)
POTE GRAC	1(**)	(0)	6(1)	4(2)	6(6)	2(**)	3(3)
PYRL ASAR	(0)	(0)	(0)	(0)	(0)	(0)	(0)
RANU ACRI	(0)	(0)	4(2)	1(**)	4(3)	1(**)	(0)
RANU ALIS	(0)	(0)	(0)	8(2)	(0)	(0)	2(**)
SAGI NA	(0)	(0)	(0)	(0)	1(**)	5(1)	2(**)
SAXI ARGU	(0)	(0)	(0)	(0)	(0)	(0)	(0)
SAXI OREG	1(**)	3(**)	2(8)	2(2)	(0)	(0)	(0)
SENE CYMB	1(**)	6(3)	(0)	1(**)	(0)	(0)	(0)
SENE INTE	(0)	(0)	6(1)	3(9)	(0)	(0)	5(18)
SENE PSEU	1(3)	(0)	(0)	(0)	4(1)	1(**)	(0)
SENE SPHA	(0)	(0)	(0)	(0)	5(6)	(0)	2(8)
SENE TRIA	(0)	(0)	(0)	(0)	(0)	(0)	(0)
SMIL STEL	1(**)	(0)	(0)	(0)	(0)	(0)	(0)
SOLI CANA	(0)	(0)	(0)	(0)	(0)	1(**)	2(**)
STEL LONG	2(**)	(0)	4(2)	6(2)	10(2)	4(1)	7(**)
SWER PERE	(0)	6(1)	(0)	(0)	(0)	(0)	(0)
TARX OFFI	1(**)	(0)	4(4)	4(5)	8(3)	6(1)	7(2)
THAL ALPI	(0)	(0)	(0)	(0)	(0)	(0)	(0)
THAL OCCI	1(**)	(0)	(0)	(0)	(0)	(0)	(0)
TRIF LONG	(0)	(0)	6(3)	7(6)	6(6)	3(1)	10(11)
VALE EDUL	(0)	(0)	(0)	(0)	(0)	(0)	2(**)
VERO AMER	1(3)	(0)	(0)	(0)	(0)	3(1)	(0)
VIOL NEPH	1(**)	(0)	4(3)	(0)	(0)	1(**)	(0)

** = TRACE COVER; CODE TO CONSTANCY VALUES:
+ = 0-5%, 1 = 5-15%, 2 = 15-25%, 3 = 25-35%, 4 = 35-45%, 5 = 45-55%, 6 = 55-65%, 7 = 65-75%
8 = 75-85%, 9 = 85-95%, 10 = 95-100%

	PICO VAOC	SAWO SUPE	SAWO CAMI	POFR DAIN	SALIX CARO	SACO CASC	SADR CACA	SAHY POPR	SAGE CACA	ALIN-COST
# OF STANDS	10	15	4	8	11	3	17	10	9	9
TREES										
ABIE LA O	(0)	(0)	(0)	(0)	(0)	(0)	1(3)	(0)	(0)	(0)
ABIE LA R	2(2)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	1(**)
PICE EN O	(0)	(0)	(0)	(0)	(0)	(0)	(0)	1(20)	(0)	1(38)
PICE EN R	3(6)	(0)	(0)	(0)	1(**)	7(2)	1(3)	1(**)	(0)	1(13)
PINU CO O	6(15)	1(8)	(0)	1(**)	(0)	(0)	1(3)	(0)	(0)	1(38)
PINU CO R	7(2)	(0)	(0)	4(1)	1(3)	3(3)	2(1)	(0)	(0)	(0)
SHRUBS										
ALNU INCA	(0)	(0)	(0)	(0)	(0)	(0)	1(63)	2(38)	(0)	10(56)
BETU GLAN	6(9)	2(17)	(0)	(0)	1(38)	(0)	1(14)	3(26)	3(46)	(0)
CORN STOL	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	7(53)
LEDU GLAN	4(13)	(0)	(0)	(0)	(0)	3(3)	(0)	(0)	(0)	(0)
LONI CAER	10(6)	8(12)	5(29)	1(**)	5(20)	7(4)	4(3)	(0)	4(8)	(0)
LONI INVO	1(3)	(0)	(0)	(0)	(0)	(0)	6(5)	2(5)	1(3)	2(4)
POTE FRUT	7(4)	5(12)	(0)	9(31)	1(**)	(0)	2(5)	2(5)	1(**)	1(3)
RIBE LACU	(0)	(0)	(0)	(0)	1(3)	(0)	4(16)	5(15)	8(3)	9(3)
SALX COMM	1(13)	(0)	(0)	(0)	(0)	10(70)	1(33)	(0)	(0)	(0)
SALX DRUM	2(5)	(0)	(0)	(0)	3(54)	(0)	9(30)	4(31)	(0)	3(3)
SALX EXIE	(0)	(0)	(0)	(0)	(0)	(0)	1(2)	(0)	(0)	1(3)
SALX GEYR	2(4)	(0)	(0)	(0)	4(29)	(0)	1(12)	4(18)	10(73)	(0)
SALX MONT	(0)	(0)	(0)	(0)	(0)	3(3)	2(24)	(0)	(0)	(0)
SALX MYRT	(0)	1(3)	(0)	(0)	4(20)	(0)	7(42)	9(47)	3(4)	2(6)
SALX PHYL	6(5)	3(6)	(0)	(0)	5(39)	10(1)	1(8)	(0)	(0)	(0)
SALX WOID	8(10)	9(53)	10(74)	(0)	5(21)	(0)	5(25)	(0)	4(2)	(0)
VACC OCCI	10(36)	(0)	(0)	(0)	(0)	7(**)	(0)	(0)	(0)	(0)
GRAMINOIDS										
AGRP CANI	(0)	1(2)	3(**)	6(6)	(0)	(0)	2(9)	3(7)	3(8)	2(3)
AGRS EXAR	(0)	1(**)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
AGRS SCAB	(0)	3(1)	3(**)	3(**)	1(**)	(0)	1(2)	1(20)	1(**)	1(38)
ALOP AEQU	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
BROM CARI	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
BROM CILI	(0)	3(3)	(0)	(0)	2(2)	(0)	5(10)	3(6)	6(10)	(0)
CALA CANA	7(5)	3(13)	3(8)	(0)	7(14)	7(20)	10(29)	2(3)	8(31)	6(16)
CARX AQUA	5(7)	7(8)	(0)	1(3)	9(27)	3(**)	3(5)	3(5)	3(3)	(0)
CARX ATHR	(0)	1(**)	(0)	4(5)	(0)	(0)	(0)	(0)	1(13)	1(**)
CARX BUXB	1(**)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
CARX CUSI	(0)	3(14)	(0)	(0)	1(20)	3(3)	(0)	1(**)	(0)	(0)
CARX DIOI	(0)	1(8)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
CARX JONE	2(2)	3(2)	3(**)	(0)	1(**)	3(3)	(0)	(0)	1(8)	(0)
CARX LENT	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
CARX LIVI	1(**)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
CARX MICR	(0)	1(**)	5(8)	(0)	1(**)	(0)	3(2)	4(3)	3(3)	2(**)
CARX MURI	5(8)	2(1)	(0)	(0)	(0)	3(3)	(0)	(0)	(0)	(0)
CARX ROST	7(4)	5(3)	3(3)	(0)	9(42)	3(3)	3(6)	5(6)	4(3)	(0)
CARX SAXA	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
CARX SCOP	1(3)	1(38)	(0)	(0)	2(10)	10(26)	2(17)	1(3)	(0)	(0)
CARX SIMU	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
DANT INTE	1(**)	1(**)	3(**)	9(12)	(0)	(0)	(0)	(0)	(0)	(0)
DESC CESP	3(24)	6(4)	5(8)	5(13)	1(8)	3(**)	1(8)	(0)	(0)	(0)
ELEO PAUC	4(6)	3(7)	(0)	1(**)	1(**)	(0)	(0)	(0)	(0)	(0)
FEST IDAH	(0)	(0)	(0)	5(2)	(0)	(0)	(0)	(0)	(0)	(0)
HORD BRAC	(0)	(0)	3(3)	(0)	(0)	(0)	1(3)	(0)	1(3)	(0)
JUNC BA/L	3(2)	6(4)	8(2)	5(8)	3(1)	(0)	1(20)	5(13)	1(8)	1(**)
KOEL CRIS	(0)	(0)	(0)	8(2)	(0)	(0)	(0)	(0)	(0)	(0)
LUZU CAMP	1(**)	3(3)	(0)	5(2)	(0)	(0)	1(**)	1(**)	(0)	(0)
MUHL FILI	4(4)	4(4)	(0)	1(**)	2(3)	3(**)	(0)	1(8)	(0)	(0)
PHLE ALPI	(0)	4(2)	5(**)	4(1)	1(**)	(0)	1(**)	1(3)	(0)	(0)
POA NEVA	(0)	(0)	3(8)	1(**)	(0)	(0)	(0)	(0)	1(**)	(0)
POA PALU	(0)	1(3)	3(3)	(0)	1(**)	(0)	1(**)	4(6)	3(9)	2(5)
POA PRAT	(0)	3(2)	5(2)	3(29)	2(2)	(0)	3(6)	10(24)	9(10)	1(8)
PUCC PAUC	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
SCIR CESP	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
STIP OCMI	(0)	(0)	(0)	3(3)	(0)	(0)	(0)	(0)	(0)	(0)
TRIS WOLF	(0)	2(1)	5(4)	(0)	(0)	(0)	2(5)	1(**)	(0)	(0)

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8 = 75-85%, 9 = 85-95%, 10 = 95-100%

# OF STANDS	PICO VAOC 10	SAWO SWPE 15	SAWO CAMI 4	POFR DAIN 8	SALIX CARB 11	SACO CASC 3	SADR CACA 17	SAMY POPR 10	SAGE CACA 9	ALIN-COST 9
FORBS										
ACHI MILL	2(**)	5(1)	8(6)	9(4)	1(**)	(0)	7(2)	8(2)	8(3)	1(**)
ACON COLU	(0)	4(5)	3(**)	(0)	2(**)	3(3)	4(2)	(0)	2(**)	(0)
AGOS GLAU	2(**)	(0)	3(8)	5(3)	(0)	(0)	(0)	(0)	(0)	(0)
ANGL ARGU	(0)	(0)	(0)	(0)	(0)	(0)	2(5)	2(2)	(0)	4(2)
ANTE CORY	3(3)	4(3)	8(2)	3(8)	(0)	3(8)	(0)	(0)	2(2)	(0)
ANTE MICR	(0)	(0)	(0)	5(3)	(0)	(0)	(0)	(0)	(0)	1(**)
ARNI CHAM	(0)	3(2)	(0)	1(3)	1(3)	(0)	2(2)	3(**)	4(**)	(0)
ARTM LUDO	(0)	(0)	(0)	(0)	(0)	(0)	(0)	1(**)	(0)	1(3)
ASTE FOLI	8(3)	9(7)	10(15)	9(3)	5(2)	10(8)	7(11)	10(13)	8(9)	4(19)
ASTE INTG	(0)	(0)	(0)	3(8)	(0)	(0)	(0)	(0)	(0)	(0)
ASTE MODE	(0)	1(8)	(0)	(0)	(0)	(0)	4(2)	2(5)	(0)	2(23)
ASTE OCCI	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
CALT BIFL	1(3)	(0)	(0)	(0)	(0)	3(38)	1(2)	(0)	(0)	(0)
CALT LEPT	3(5)	3(25)	(0)	(0)	1(**)	(0)	(0)	(0)	(0)	(0)
CAST CUSI	1(**)	(0)	5(**)	5(2)	(0)	(0)	1(3)	(0)	(0)	(0)
CIRS IUM	(0)	1(**)	(0)	4(3)	(0)	(0)	1(2)	2(2)	(0)	(0)
DODE JEFF	3(4)	(0)	5(2)	(0)	(0)	7(2)	1(**)	(0)	(0)	2(2)
EPIL GLAN	(0)	1(**)	5(**)	1(**)	2(3)	(0)	2(2)	4(**)	2(3)	2(2)
EQUI ARVE	(0)	1(**)	(0)	(0)	2(3)	3(3)	6(4)	7(31)	3(21)	4(2)
ERIG PERE	3(2)	(0)	(0)	(0)	(0)	3(**)	(0)	(0)	(0)	(0)
FRAG VIRG	5(2)	8(8)	3(20)	9(6)	2(**)	3(**)	5(5)	4(2)	6(9)	2(2)
GALI TRFI	1(**)	2(1)	3(3)	(0)	6(1)	7(2)	4(3)	2(2)	3(1)	(0)
GALI TRFL	(0)	(0)	(0)	(0)	(0)	(0)	2(4)	1(**)	1(**)	6(6)
GENT AFFI	2(**)	1(**)	3(8)	6(3)	(0)	(0)	(0)	1(**)	(0)	(0)
GEUM MACR	(0)	4(**)	3(3)	1(**)	2(2)	(0)	7(3)	8(2)	9(4)	2(4)
GEUM TRIF	(0)	(0)	(0)	8(3)	(0)	(0)	(0)	(0)	(0)	(0)
HORK FUSC	(0)	(0)	(0)	3(4)	(0)	(0)	(0)	(0)	(0)	(0)
LIGU TENU	6(3)	6(6)	5(3)	3(2)	(0)	7(**)	2(1)	(0)	(0)	(0)
LINA MARK	(0)	(0)	(0)	1(**)	(0)	(0)	(0)	(0)	(0)	(0)
MERT CILI	(0)	(0)	(0)	(0)	(0)	(0)	2(2)	(0)	1(**)	(0)
MIMU GUTT	(0)	(0)	(0)	(0)	(0)	(0)	(0)	1(3)	(0)	(0)
MIMU PRIM	2(3)	3(2)	(0)	(0)	(0)	3(3)	(0)	(0)	(0)	(0)
MITE PENT	1(**)	(0)	(0)	(0)	(0)	(0)	3(**)	(0)	(0)	(0)
PEDI GROE	4(2)	7(5)	5(2)	(0)	1(**)	7(3)	3(1)	(0)	(0)	(0)
PENS GLOB	(0)	1(**)	8(3)	3(5)	2(10)	(0)	2(2)	(0)	1(**)	(0)
POLE OCCI	(0)	5(4)	3(**)	(0)	5(3)	(0)	6(4)	4(7)	3(3)	1(**)
POLY BIST	2(**)	(0)	3(**)	(0)	(0)	3(**)	1(**)	(0)	(0)	(0)
POLY DOUG	(0)	(0)	3(**)	4(**)	(0)	(0)	(0)	(0)	(0)	(0)
POTE DIVE	1(**)	1(3)	5(4)	4(9)	(0)	3(**)	(0)	(0)	(0)	(0)
POTE GRAC	(0)	3(**)	3(3)	9(3)	(0)	(0)	1(5)	4(2)	2(3)	1(**)
PYRL ASAR	(0)	(0)	(0)	(0)	(0)	(0)	(0)	4(2)	1(**)	(0)
RANU ACRI	(0)	1(**)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
RANU ALIS	2(**)	1(**)	(0)	3(**)	(0)	(0)	(0)	(0)	(0)	(0)
SAGI NA	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
SAXI ARGU	(0)	(0)	(0)	(0)	1(**)	(0)	2(1)	(0)	(0)	(0)
SAXI OREG	(0)	3(1)	3(**)	(0)	2(**)	3(3)	1(**)	(0)	(0)	(0)
SENE CYMB	5(3)	3(7)	(0)	(0)	(0)	7(4)	(0)	(0)	(0)	(0)
SENE INTE	(0)	(0)	5(**)	3(2)	(0)	(0)	1(**)	(0)	(0)	(0)
SENE PSEU	(0)	6(5)	5(3)	1(**)	1(**)	(0)	2(2)	4(1)	8(3)	(0)
SENE SPHA	(0)	(0)	(0)	3(4)	(0)	(0)	(0)	1(**)	(0)	(0)
SENE TRIA	(0)	(0)	(0)	(0)	(0)	3(**)	5(4)	(0)	(0)	1(**)
SMIL STEL	(0)	(0)	(0)	(0)	1(**)	(0)	3(6)	3(1)	3(15)	4(4)
SOLI CANA	(0)	(0)	(0)	(0)	(0)	(0)	1(33)	2(**)	3(4)	2(2)
STEL LONG	1(**)	7(1)	8(1)	6(1)	1(**)	(0)	2(1)	4(1)	6(2)	1(**)
SWER PERE	9(2)	9(7)	(0)	(0)	(0)	3(3)	1(**)	(0)	(0)	1(3)
TARX OFFI	(0)	5(1)	5(3)	9(2)	(0)	(0)	4(1)	8(4)	6(2)	1(**)
THAL ALPI	(0)	1(8)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
THAL OCCI	(0)	1(**)	(0)	(0)	1(**)	(0)	6(7)	4(2)	(0)	3(3)
TRIF LONG	3(2)	7(2)	10(2)	8(2)	1(3)	(0)	2(2)	2(2)	3(2)	(0)
VALE EDUL	(0)	1(3)	(0)	4(3)	(0)	(0)	(0)	(0)	(0)	(0)
VERO AMER	(0)	1(**)	(0)	(0)	1(**)	(0)	(0)	1(**)	(0)	(0)
VIOL NEPH	(0)	(0)	(0)	(0)	1(3)	(0)	(0)	(0)	(0)	(0)

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APPENDIX C

ASSOCIATION TABLES

	CARO													SALIX/CARO									
	ST L4A	STL L5A	AS L3A	VL R1B	FR L3A	4J II R1C	SL L3B	AY MDW -1C	BVR L3A	STL R6B	WB L6A	LC L2A	HL VT R2F	MR L3B	EL WET MDW -2A	AY MDW -2A	BVR L3B	BAN R3A	MA I R5A	HD I -7B	MA I R4E	FI I -2C	STL L5B	HO R2A
	59	65	107	53	70	150	8	114	84	69	20	9	134	97	117	111	85	94	135	152	136	145	66	2
TREES																								
PICE EN R	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.
PINU CO O	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PINU CO R	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.
SHRUBS																								
ALNU INCA	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.
BETU GLAN	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.
LONI CAER	.	.	.	.	.	.	.	.	1	T	.	.	.	.	2	7	1	1	.	.	T	.	.	.
LONI INVO	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
POTE FRUT	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.
RIBE LACU	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.
RIBE HUDS	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1	.	.
SALX DRUM	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	5	7	.	.	.	.
SALX GEYR	.	.	.	.	.	.	T	.	.	1	.	.	.	.	.	.	.	.	.	.	6	3	4	4
SALX MYRT	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	5	1	.	.	5	.	1
SALX PHYL	.	T	1	.	.	.	.	1	T	T	.	.	T	7	7	2	.	1	.	.	.	.	3	.
SALX WOID	T	T	.	.	.	.	.	.	1	T	.	.	.	1	.	5	5	4	.	.	.	.	2	.
VACC OCCI	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GRAMINOIDS																								
AGRP CANI	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.
AGRS EXAR	.	.	.	.	.	.	.	.	.	T	.	T	.	.	.	.	.	.	.	.	.	.	.	.
AGRS SCAB	.	.	.	.	.	.	.	T	.	T	.	.	.	.	.	.	.	.	.	T	.	.	.	.
BROM CILI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	1	.	.	.	.	.	.	.
CALA CANA	.	.	.	1	.	.	.	.	2	5	2	.	1	.	.	1	4	5	4	2	4	1	1	.
CARX AQUA	6	6	4	5	4	1	.	3	7	5	4	.	2	3	T	.	6	4	4	5	5	5	5	2
CARX BUXB	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.
CARX CANE	.	.	1	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	1	.	.	.
CARX CUSI	.	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.
CARX DISP	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	1	.	1	.	.	.
CARX JONE	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.
CARX LIVI	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
CARX MICR	.	T	.	.	T	.	.	.	.	T	.	T	.	.	.	.	.	.	.	.	.	.	.	T
CARX MURI	.	.	4	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX ROST	6	6	7	7	6	6	8	5	.	1	5	2	.	6	5	6	4	5	4	5	4	5	.	7
CARX SAXA	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.
CARX SCOP	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	3	.	.	.	.	.
CARX SIMU	.	.	.	.	.	.	.	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
DESC CESP	.	T	T	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	2	.
ELEO PAUC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T
GLYC STRI	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.
HORD BRAC	.	.	.	4	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
JUNC BA/L	.	.	.	.	T	1	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	T	.	T
LUZU CAMP	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MUHL FILI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1
PHLE ALPI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.
POA PALU	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.
POA PRAT	.	.	.	T	T	T	.	.	T	T	.	1	.	.	.	.	1	.	.	.	.	T	.	.
FORBS																								
ACHI MILL	.	.	.	.	T	T	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.
ACON COLU	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	T	.	.	.	.	.	.
ARNI CHAM	.	.	.	1	1	.	.	.	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
ASTE FOLI	.	T	.	T	.	.	.	.	.	1	.	.	T	T	.	1	1	1	.	.	.	.	T	.
CALT LEPT	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.
CAST MINI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.
DODE JEFF	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
EPIL ANGU	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.
EPIL GLAN	1	.	.	1	1	T	.	T	.	1	1	4	.	.	.	.	.	.	.	1	.	1	.	.
EQUI ARVE	.	.	.	.	.	.	2	.	.	.	5	4	.	.	.	.	.	.	.	1	.	1	.	.
FRAG VIRG	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	T	.	.	.	.	T	.	.	.
GALI TRFI	T	T	.	1	1	1	.	T	1	1	1	.	.	.	1	T	1	T	T	.	.	T	.	T
GEUM MACR	.	.	.	1	1	T	.	.	.	T	.	.	.	.	.	1	T	.	.	.	.	.	.	.
MIMU GUTT	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.
PEDI GROE	.	.	1	.	.	.	.	1	.	.	.	.	T	T	.	.	.	.	.	.	.	.	.	.
PENS GLOB	.	.	.	.	.	.	.	.	.	.	.	.	.	T	4	.	.	.	.	.	.	.	.	.
POLE OCCI	.	.	.	.	2	1	.	.	T	.	.	1	.	.	.	1	2	1	.	T	.	.	.	T
POTE GRAC	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SAXI ARGU	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
SAXI OREG	.	.	.	.	.	.	.	.	.	T	.	.	.	T	.	.	T	.	.	.	.	.	.	.
SENE CYMB	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.
SENE PSEU	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	T	.	.	.	.	.	.	.
SMIL STEL	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	T	.	.
STEL LONG	.	.	.	T	T	T	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.
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VERO AMER	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	T	.	.
VIOL NEPH	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1

	ELPA									JUBA					DECE								
	HL VT R4A	MA I L3C	ST L2B	BS -1A	HU -1A	CPH SUM -1B	EL WET MDW -2B	MCK SO	STL L3A	ST R2A	AY MDW -1A	4J II R1B	PCM B	MR R1A	BVR R2B	BVR R4D	BEN L1A	BS -1C	AY MDW -1B	HU -1B	VL R3A	BVR R4C	VAN SUM
	132	138	64	100	73	90	118	37	50	62	112	151	160	104	88	83	92	101	113	74	55	82	79
TREES																							
PICE EN R	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T
PINU CO R	T	T	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SHRUBS																							
BETU GLAN	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
LONI CAER	T	T	.	.	T	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
POTE FRUT	T	T	.	.	T	.	.	.	T	.	.	1	.	.	.	.	.	.	.	1	.	.	.
SALX COMM	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SALX PHYL	.	.	.	.	.	.	T	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SALX WOID	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
VACC OCCI	T	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GRAMINOIDS																							
AGRP CANI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
AGRS IDAH	.	.	.	.	.	1	T	.	.	.	.	.	.	1	1	2	1	.	.	.	.	T	.
CARX AQUA	1	.	.	.	.	1	T	.	T	.	.	.	1	1	.	1	1	.	T	.	.	T	.
CARX ATHR	.	.	.	.	.	.	.	.	.	6	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX BUXB	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX CANE	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX CUSI	.	.	1	.	.	.	.	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.
CARX DIOI	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX JONE	.	.	.	.	.	T	.	.	.	.	.	.	.	1	T	3	.	.	.	.	T	.	.
CARX LANU	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.	1	.	.	.	.	.	.
CARX LIVI	1	4	.	4	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX LUZU	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	T	.
CARX MICR	.	.	.	.	.	.	.	.	.	2	.	.	.	1	T	1	T	1	1	.	T	1	.
CARX MURI	T	1	.	T	4	.	T	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX PRAE	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	T	.	.
CARX ROST	.	.	1	1	2	.	3	.	1	.	.	.	.	1	T	.	.	.	.	.	.	.	.
CARX SCOP	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX SIMU	.	.	5	.	2	T	.	.	.	5	4	.	.	1	.	.	.	.	.	.	.	.	.
DANT INTE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	T	.
DESC CESP	.	T	.	T	.	T	3	.	1	5	5	1	1	4	5	3	5	5	5	5	3	4	2
ELEO PAUC	2	3	5	7	4	6	5	2	4	.	.	.	.	1	4	4	5	.	.	.	.	.	.
HORD BRAC	.	.	.	.	.	.	.	.	.	1	.	T	1	T	.	.	.	.	.	.	.	T	.
JUNC BA/L	.	T	1	.	.	.	.	.	1	5	6	5	6	6	1	.	.	T	T	.	.	T	.
KOEL CRIS	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	T	.
LUZU CAMP	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	2	.	T	.	.	T	2	1
MUHL FILI	.	.	.	.	T	1	.	.	1	1	.	5	2	2	6	2	1	.	.	.	1	1	.
PHLE ALPI	.	.	.	.	.	.	.	.	.	.	.	.	T	2	1	1	1	1	.	.	1	2	1
POA PRAT	.	.	.	.	.	.	.	.	.	.	.	T	1	1	.	.	T	T	.	.	1	1	.
SCIR CESP	5	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
STIP OCHI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.
TRIS WOLF	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	1	.	.	.	.	.	1	.
FORBS																							
ACHI MILL	.	.	.	.	.	.	.	.	.	.	.	T	1	T	.	T	.	1	.	.	2	4	.
AGOS GLAU	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	3	1	T	.	.	.
ANTE CORY	.	.	.	.	.	.	.	.	.	.	.	.	.	1	T	1	1	4	1	3	.	.	1
ARNI CHAM	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	T	1	.
ASTE FOLI	T	.	.	.	.	T	.	.	.	5	T	1	1	1	2	1	1	1	.	.	T	3	T
ASTE OCCI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.
CALT LEPT	.	.	1	1	.	.	.	1	T	.	.	.	.	.	T	.	T	.	.	.	.	.	.
CAST CUSI	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	1	T	2	.	.	3	.
CIRS IUM	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.
DODE JEFF	.	.	.	.	.	.	.	.	.	.	2	.	.	2	5	1	.	.	.	.	.	.	1
DROS ANGL	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
EPIL GLAN	.	.	.	.	.	.	.	.	.	T	T	T	.	T	T	.	.	.	.	T	.	T	.
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ERIG PERE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
FRAG VIRG	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
GALI TRFI	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	.	.	.	.	.	.	.
GENT AFFI	.	.	.	.	.	.	.	.	.	.	2	.	.	T	.	.	.	1	2	.	.	.	T
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LIGU TENU	T	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	T	.	.	.	.	T	.
MIMU PRIM	.	.	T	.	.	2	1	.	.	.	.	.	.	T	1	1	.	.	.	.	.	.	.
PEDI GROE	1	T	T	1	1	1	1	1	1	.	.	.	.	2	2	1	T	.	.	T	.	.	2
PENS GLOB	.	.	.	.	.	.	.	.	.	1	3	.	.	1	.	.	T	.	1	1	.	.	.
POLE OCCI	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.
POLY BIST	.	.	.	.	.	.	3	.	.	T	.	.	.	T	2	.	1	T	T	.	.	.	1
POLY DOUG	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
POTE DIVE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	T	.	.	T	T
POTE GRAC	.	.	.	.	.	.	.	.	.	1	.	T	T	.	.	T	1	.	.	.	.	1	1
RANU ACRI	.	.	.	.	.	.	.	.	.	T	.	.	1	.	.	.	.	.	.	.	T	.	.
RANU ALIS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	T	1	T	1	.	.	T	1
SAXI OREG	.	.	T	.	.	.	T	T	.	.	.	.	.	2	.	1	.	.	.	.	.	T	.
SENE CYMB	1	.	.	.	.	T	2	1	1	.	.	.	.	.	.	T	.	.	.	.	.	.	.
SENE INTE	.	.	.	.	.	.	.	.	.	T	1	.	.	T	.	.	1	.	3	.	.	3	.
STEL LONG	.	.	.	.	.	.	.	.	.	.	.	T	.	1	.	T	1	.	.	.	1	1	T
SWER PERE	1	T	T	T	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
TARX OFFI	.	.	.	.	.	.	.	.	.	.	.	.	2	T	.	T	1	.	.	.	2	2	.
TRIF LONG	.	.	.	.	.	.	.	.	.	1	.	.	1	1	1	1	.	1	1	.	1	4	.
VERO WORM	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	T	.	.	.	.	.	.	1
VIOL NEPH	.	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.

		POPR								ASIN-FEID					
		FR L3C	HD I R7D	4J III L1E	MR CAN R2A	FI I L3B	WS L4B	LC L2B	BA R4E	MCK R1A	VL R1C	FR L3B	BVR R4A	AY MDW -1E	EL L2A
		72	153	148	172	144	16	10	31	39	54	71	80	116	122
TREES															
SHRUBS															
POTE	FRUT	1	.	.	.	.	.	.	.	.	.	.	.	.	.
SALX	GEYR	.	.	.	.	.	.	T	.	.	.	.	.	.	.
SALX	MYRT	.	.	.	.	.	.	1	.	.	.	.	.	.	.
SALX	WOID	T	.	.	.	.	.	.	.	.	.	.	.	.	.
GRAMINOIDS															
AGRP	CANI	T	T	T	2	.	1	.	.	.	1	1	1	5	1
AGRS	SCAB	T	.	.	T	.	.	.	4	.	.	.	1	1	.
ALOP	AEQU	.	.	.	.	.	.	.	1	.	.	.	.	.	.
BROM	CARI	.	.	.	.	.	.	.	.	.	.	T	1	T	.
BROM	CILI	.	.	1	1	.	1	1	.	.	.	.	.	.	.
CARX	AQUA	1	1	.	2	5	.	.	.	.	.	.	.	.	.
CARX	ATHR	.	.	.	.	.	.	.	.	4	.	.	.	.	.
CARX	MICR	1	3	.	1	.	T	5	6	1	T	T	.	5	5
CARX	PRAE	.	.	.	.	.	.	.	.	.	1	.	.	.	.
CARX	PRAT	.	.	.	.	.	2	.	.	.	1	.	.	.	1
CARX	ROST	.	.	1	.	.	.	.	.	.	.	.	.	.	.
DANT	INTE	.	.	.	.	.	.	.	.	.	1	.	.	.	.
DESC	CESP	.	T	.	.	.	.	.	.	T	T	.	.	.	.
FEST	IDAH	.	.	.	.	.	.	.	.	.	4	1	.	.	.
HORD	BRAC	1	2	.	1	1	.	.	.	.	.	1	1	.	.
JUNC	BA/L	5	1	.	.	1	5	4	.	.	1	.	.	.	T
KOEL	CRIS	.	.	.	.	.	.	.	.	.	1	T	.	4	.
LUZU	CAMP	1	1	.	.	.	.	.	.	.	.	.	.	3	.
MELI	SPEC	.	.	.	T	.	.	.	.	.	.	1	.	2	.
MUHL	FILI	.	.	.	.	.	.	.	4	.	.	.	.	.	.
PHLE	ALPI	T	1	.	1	.	.	.	.	.	.	.	T	2	.
POA	NEVA	.	.	.	.	.	.	.	.	.	.	2	.	1	5
POA	PALU	.	.	.	.	.	.	.	1	.	.	.	.	.	.
POA	PRAT	4	2	5	4	5	7	5	3	1	5	.	.	.	.
STIP	OCHI	.	.	.	.	.	T	.	.	2	1	T	T	T	.
TRIS	WOLF	T	.	1	1	2	.	.	.	.	.	.	.	.	.
FORBS															
ACHI	MILL	2	1	1	1	1	1	.	.	T	1	1	1	2	1
AGOS	GLAU	T	.	T	.	.	.	.	.	.	1	T	.	.	.
ANTE	CORY	2	.	.	.	.	.	.	2	5	.	.	.	.	.
ANTE	MICR	.	.	.	.	.	T	.	T	.	2	T	.	.	.
ARNI	CHAM	T	T	.	1	2	4	.	.	.	.	.	.	.	.
ASTE	FOLI	1	1	2	2	1	1	1	.	.	.	.	1	.	1
ASTE	INTG	.	.	.	.	.	.	.	.	.	1	4	1	.	.
CAST	CUSI	.	1	.	.	.	.	.	.	.	T	.	.	.	T
CAST	MINI	.	.	.	.	.	.	1	.	.	.	.	.	.	.
CIRS	IUM	.	T	T	.	.	.	.	.	T	1	T	T	.	.
EPIL	GLAN	T	.	T	.	1	.	T	T	.	.	.	T	.	.
EQUI	ARVE	.	.	.	.	.	.	T	.	.	.	.	.	.	.
FRAG	VIRG	1	T	2	2	.	1	.	.	1	5	2	.	4	.
GALI	TRFI	.	.	.	.	.	.	T	1	.	.	.	.	.	.
GENT	AFFI	.	.	.	.	.	1	.	.	.	.	.	.	.	.
GEUM	MACR	1	1	1	.	T	.	T	T	.	.	.	T	.	.
GEUM	TRIF	.	.	.	.	.	.	.	.	1	2	T	.	T	.
LINA	MARK	.	.	.	.	.	.	.	.	.	.	T	1	1	.
MIMU	PRIM	.	.	.	.	.	.	.	.	.	.	.	T	.	.
PENS	GLOB	.	.	.	1	.	.	.	1	6	.	.	T	.	.
POLE	OCCI	T	.	1	T	.	.	.	.	.	.	.	.	.	.
POLY	BIST	.	.	.	.	.	.	.	.	.	.	.	.	.	1
POLY	DOUG	.	.	.	.	.	.	.	.	T	T	T	1	T	.
POTE	GRAC	T	1	1	1	.	4	.	.	.	1	1	.	.	.
RANU	ACRI	1	1	1	.	.	.	.	.	.	.	.	.	.	.
RANU	ALIS	.	.	.	.	.	.	.	.	.	.	.	.	.	T
SAGI	NA	.	T	.	.	.	.	.	.	.	.	.	T	.	.
SENE	INTE	.	.	.	.	.	.	.	.	.	.	.	2	2	5
SENE	PSEU	1	.	T	.	.	T	.	.	.	.	.	.	.	.
SENE	SPHA	T	T	1	.	4	.	.	.	.	.	2	.	.	.
SOLI	CANA	.	.	.	.	.	.	.	.	.	T	.	.	.	.
STEL	LONG	1	T	1	1	T	1	1	T	T	.	T	T	T	.
TARX	OFFI	1	1	1	.	.	T	2	T	.	T	2	T	T	.
TRIF	LONG	4	1	1	.	1	.	.	T	2	3	1	1	1	5
VALE	EDUL	.	.	.	.	.	.	.	.	.	.	.	T	.	.

	AGSC-bar													SAEX		
	MR CAN R2B	RF BTW L1G	BVL C1A	BVL R1B	HD I L7A	MF R2A	FK III R1A	4J III L1B	YF L5A	WS MDW L1B	WS MDW C2A	BVR R4B	ST L4C	SL R2A	SL R4A	SA BRG R1A
	173	178	128	177	154	176	142	147	44	165	167	81	61	6	13	170
TREES																
PICE EN R	.	.	.	.	.	.	.	T	.	.	.	T	.	.	.	.
PINU CO R	.	T	.	.	.	.	T	T	T	.	.	T	1	.	.	.
SHRUBS																
ALNU INCA	.	T	.	.	.	T	.	.	.	.	.	.	.	4	.	.
BETU GLAN	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
LONI CAER	.	T	.	.	.	.	.	.	.	.	.	.	T	.	.	.
POTE FRUT	.	T	.	.	.	.	1	.	.	T	T	.	.	.	.	.
RIBE LACU	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	T
RIBE HUDS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
SALX DRUM	T	T	4	2	T	.	1	1	T	.	.	T	2	.	.	1
SALX EXEX	.	.	.	.	.	.	.	.	T	.	T	.	.	2	2	5
SALX EXNE	T	.	5	2	.	1	.	.	.	.	.	T	.	.	.	.
SALX GEYR	.	1	.	.	.	.	.	.	.	.	.	.	1	T	T	.
SALX HYRT	T	1	.	.	.	.	T	1	T	1	1	.	1	3	4	1
SALX WOID	.	T	.	.	.	.	.	.	.	1	.	T	.	.	.	.
VACC OCCI	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GRAMINOIDS																
AGRP CANI	.	.	.	.	.	.	T	T	T	T	1	T	.	T	1	1
AGRS EXAR	2	.	.	.	1	2	T	T	T	.	.	1	1	.	.	.
AGRS SCAB	T	3	.	T	1	1	1	1	T	1	.	1	2	1	.	T
ALOP AEQU	1	.	T	.	1	T	.	.	T	.	.	.	.	.	.	.
BROM CARI	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
BROM CILI	.	.	.	.	.	.	T	.	.	T	.	.	.	.	.	.
CALA CANA	1	1	.	.	.	1	.	.	.	.	.	.	.	.	.	1
CARX AQUA	T	3	.	2	.	.	.	.	.	.	.	.	1	.	.	.
CARX ATHR	1	.	.	T	.	T	.	.	T	.	.	.	.	.	.	.
CARX CANE	.	T	.	.	.	.	.	.	T	.	.	.	2	.	.	.
CARX JONE	.	.	.	.	.	.	.	.	.	.	.	T	1	.	.	.
CARX LENT	5	2	1	T	.	3	.	.	.	.	.	.	.	.	.	.
CARX MICR	.	.	.	.	T	.	T	T	T	T	T	.	T	1	3	.
CARX MURI	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX PRAT	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.
CARX ROST	T	T	.	1	.	T	.	.	.	.	.	.	1	.	.	.
CARX SAXA	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX SCOP	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
DESC CESP	.	T	.	1	.	.	.	.	.	1	.	1	1	.	.	.
ELEO PAUC	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
GLYC STRI	T	T	.	.	.	.	.	.	.	.	.	.	T	.	.	.
HORD BRAC	1	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
JUNC BA/L	T	1	.	1	.	.	.	.	.	.	.	.	.	1	2	.
LUZU CAMP	.	.	.	.	.	.	1	.	.	.	.	T	T	.	.	.
LUZU PARV	.	.	.	.	.	.	1	T	.	.	.	.	.	.	.	.
MUHL FILI	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
PHLE ALPI	.	.	.	.	T	.	T	T	T	T	T	T	T	.	.	.
POA LEPT	.	.	.	.	T	.	.	.	T	1	T	.	.	.	.	.
POA PALU	.	T	.	.	.	.	.	1	T	.	.	.	.	1	T	2
POA PRAT	.	.	.	.	.	.	.	T	T	.	.	.	.	T	4	T
PUCC PAUC	1	.	1	T	.	T	.	.	.	.	.	.	.	.	.	.
TRIS WOLF	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
FORBS																
ACHI MILL	.	.	.	.	.	.	T	T	T	T	1	T	.	1	1	T
AGOS GLAU	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.
ANTE CORY	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	T
ANTE MICR	.	.	.	.	.	.	.	.	T	T	T	.	.	.	.	.
ARNI CHAM	.	.	.	1	.	T	.	.	.	T	.	.	.	.	.	T
ARTH LUDO	.	.	.	.	.	.	.	T	T	.	T	.	.	.	T	.
ASTE FOLI	T	1	.	T	.	1	1	1	T	T	T	T	1	2	3	1
ASTE MODE	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ASTR ALPI	.	.	.	.	.	.	1	1	.	1	.	T	.	.	.	.
CALT LEPT	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
CAST MINI	.	.	.	.	.	.	.	1	T	.	T	.	.	.	T	T
CIRS IUM	.	.	.	.	.	.	.	.	T	T	T	T	.	.	1	1
DODE JEFF	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
EPIL ANGU	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.
EPIL GLAN	1	.	.	T	1	.	T	.	T	1	.	T	T	.	.	.
EQUI ARVE	6	.	.	.	.	T	.	.	.	.	.	T	1	T	T	.
FRAG VIRG	.	.	.	.	.	.	T	.	T	T	.	T	1	.	.	.
GALI TRFI	.	.	.	.	.	T	.	.	.	.	.	.	T	.	.	.
GEUM MACR	.	.	.	.	.	.	T	.	.	.	T	T	.	.	1	T
MERT CILI	.	.	.	.	.	.	.	T	T	.	T	.	.	.	1	.
MIMU GUTT	.	.	.	.	1	.	.	.	T	T	.	.	.	.	.	.
MIMU PRIM	.	.	.	.	.	.	.	.	.	.	.	T	1	.	.	.
PEDI GROE	.	.	.	T	.	T	.	.	.	.	.	T	T	.	.	.
PENS GLOB	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.
POLE OCCI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
POTE GRAC	.	.	.	T	.	.	.	.	.	.	T	.	.	.	T	T
RANU ACRI	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.
SAGI NA	.	.	.	.	1	.	T	1	T	T	.	T	.	.	.	.
SELA SELA	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.
SENE PSEU	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.
SOLI CANA	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.
STEL LONG	.	.	.	.	.	.	T	.	1	T	.	1	T	.	T	T
TARX OFFI	T	.	.	.	T	.	T	T	T	1	1	1	.	1	2	T
TRIF LONG	.	.	.	.	.	T	.	.	T	.	.	1	T	.	.	.
URTI DIOC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.
VERO AMER	T	.	.	.	1	T	.	.	.	.	.	T	.	.	.	.
VERO WORM	.	.	.	.	.	.	.	.	T	.	.	T	.	.	.	.
VIOL NEPH	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.

PICO/VAOC

	AS L3B	EL WET MDW -1B	CPH SUM -1A	STL L2A	MA I L3B	STL R5A	HL VT R4C	STL R6A	BS -1B	STL L3B
	108	121	89	76	137	67	133	68	102	51
TREES										
ABIE LA R	.	.	T	.	.	1	.	.	.	.
PICE EN R	1	.	1	.	.	3	.	.	.	.
PINU CO O	1	.	.	1	1	6	3	.	.	1
PINU CO R	1	.	1	T	T	1	1	.	.	1
SHRUBS										
BETU GLAN	.	.	.	4	1	1	.	2	2	3
LEDU GLAN	1	.	2	.	.	1	5	.	.	.
LONI CAER	2	2	1	1	3	1	2	1	1	3
LONI INVO	.	.	.	.	.	1	.	.	.	.
POTE FRUT	.	.	.	1	T	1	3	1	T	1
SALX COMM	.	.	3	.	.	.	.	.	.	.
SALX DRUM	.	.	.	1	.	2	.	.	.	.
SALX GEYR	.	.	.	2	.	.	.	.	.	T
SALX PHYL	2	1	2	.	.	.	.	1	2	1
SALX WOID	1	5	.	4	T	1	.	1	1	3
SHEP CANA	.	.	1	.	.	T	.	.	.	.
VACC CAES	.	.	.	.	.	3	1	.	T	1
VACC OCCI	7	6	6	5	6	2	5	1	1	1
GRAMINOIDS										
AGRS IDAH	T	1	.	.	.	.	.	.	.	.
CALA CANA	1	.	1	1	1	2	3	.	.	1
CARX AQUA	1	1	2	.	.	.	.	4	.	1
CARX BUXB	.	.	.	.	.	.	.	T	.	.
CARX DISP	.	.	.	.	1	.	.	.	.	.
CARX JONE	.	.	T	.	.	.	.	.	.	1
CARX LIVI	.	.	.	.	.	.	.	.	T	.
CARX LUZU	.	.	1	.	.	.	.	.	1	T
CARX MURI	T	T	.	.	T	.	.	1	.	5
CARX ROST	1	1	.	1	2	.	.	2	1	1
CARX SCOP	.	.	1	.	.	.	.	.	.	.
DANT INTE	.	.	.	.	.	.	.	.	T	.
DESC CESP	.	.	.	.	.	.	.	1	6	2
ELEO PAUC	T	.	.	.	.	.	.	T	1	4
JUNC BA/L	.	.	.	.	T	.	.	.	1	1
LUZU CAMP	.	.	.	.	.	.	.	.	T	.
MUHL FILI	.	3	T	.	.	.	.	T	.	1
FORBS										
ACHI MILL	.	.	.	.	.	.	.	.	T	T
AGOS GLAU	.	T	.	.	.	.	.	.	T	.
ANTE CORY	.	1	.	.	.	.	.	.	1	1
ASTE FOLI	1	1	1	1	.	T	.	1	1	1
CALT BIFL	.	.	1	.	.	.	.	.	.	.
CALT LEPT	.	.	.	.	1	.	.	.	1	2
CAST CUSI	.	T	.	.	.	.	.	.	.	.
DODE JEFF	.	.	2	.	.	.	1	.	T	.
EPIL ANGU	.	.	.	.	.	1	.	.	.	.
ERIG PERE	.	.	1	.	.	T	1	.	.	.
FRAG VIRG	1	1	T	.	.	1	.	.	.	1
GALI TRFI	.	.	.	.	.	.	.	T	.	.
GENT AFFI	.	.	.	.	.	T	T	.	.	.
LIGU TENU	1	1	T	.	.	.	T	.	1	2
MIMU PRIM	.	1	.	.	.	.	.	.	.	1
MITE PENT	.	.	T	.	.	.	.	.	.	.
PEDI GROE	.	T	T	.	.	.	.	T	.	2
POLY BIST	.	T	.	.	.	.	T	.	.	.
POTE DIVE	.	T	.	.	.	.	.	.	.	.
RANU ALIS	.	T	.	.	.	.	.	.	T	.
SENE CYMB	.	1	1	.	.	.	.	T	1	2
STEL LONG	.	.	.	.	.	.	.	.	T	.
SWER PERE	T	T	T	1	T	.	2	1	T	1
TRIF LONG	.	1	.	.	.	.	.	.	T	1

	SAWO/SWPE															SAWO/CAMI			
	BA R4A	4J II L5A	HD I R7E	WS MDW L1A	FK III L1B	MCK R1B	BEN L1B	MR L3D	PA L1A	BVR R2A	ST L2A	PO II L3C	PCM A	DA L1A	KN R3B	AY MDW -1D	BVL R2A	MR L3A	MCK R1C
	27	149	155	164	141	40	93	99	57	87	63	163	159	109	106	115	125	96	42
TREES																			
PINU CO O	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SHRUBS																			
BETU GLAN	.	.	.	.	5	.	.	.	T	.	.	3	.	.	.	.	.	.	.
LONI CAER	4	3	.	T	3	3	1	1	1	2	3	4	.	5	.	.	4	.	5
POTE FRUT	2	1	.	.	4	.	.	.	T	1	5	3	.	.	.	.	.	.	.
SALX MYRT	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SALX PHYL	.	.	.	.	.	.	2	1	1	1	.	.	.	.	3	.	.	.	.
SALX WOID	7	6	5	6	5	5	6	6	5	5	4	3	.	7	4	7	6	6	7
VACC CAES	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GRAMINOIDS																			
AGRP CANI	.	.	.	.	.	.	.	.	.	.	.	.	.	T	1	.	.	T	.
AGRS EXAR	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
AGRS IDAH	.	.	.	.	.	.	5	1	.	1	.	.	.	.	.	.	.	.	.
AGRS SCAB	T	.	T	.	.	.	.	.	.	1	T	.	.	.	.	T	.	.	.
BROM CILI	1	T	.	.	1	.	.	.	.	.	.	.	.	2	1	.	.	.	.
CALA CANA	1	.	.	.	5	.	.	.	.	T	.	.	.	4	1	.	.	.	2
CARX AQUA	2	1	1	3	2	.	2	.	2	3	.	1	.	3	.	.	.	.	.
CARX ATHR	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX CUSI	4	2	1	.	.	.	.	.	.	5	1	.	.	.	.	.	.	.	.
CARX DIOI	.	2	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.
CARX JONE	.	.	.	.	.	.	T	T	T	2	.	.	.	.	T	T	.	.	.
CARX LUZU	.	.	.	.	.	.	1	1	.	2	.	.	.	.	.	.	.	.	.
CARX MICR	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	1	.	3
CARX MURI	.	.	.	.	.	.	.	.	1	T	T	.	.	.	.	.	.	.	.
CARX ROST	1	.	2	.	.	T	.	.	.	.	1	1	1	.	T	1	.	.	.
CARX SCOP	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.
DANT INTE	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	T	.	.
DESC CESP	.	2	.	1	.	.	2	2	1	1	1	.	1	.	T	2	2	.	.
ELEO PAUC	.	.	.	.	.	.	4	.	.	1	.	1	1	.	.	.	.	.	.
HORD BRAC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
JUNC BA/L	2	1	2	.	1	.	.	.	2	T	1	1	1	.	.	1	1	T	.
LUZU CAMP	.	.	T	.	.	.	.	1	T	2	.	.	.	.	.	.	.	.	.
LUZU PARV	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.
MUHL FILI	1	1	.	.	.	.	.	.	1	1	1	.	2	.	.	.	.	.	.
PHLE ALPI	T	T	.	T	.	.	1	.	1	2	.	.	.	.	.	T	T	.	.
POA NEVA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.
POA PALU	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	1
POA PRAT	1	T	.	T	.	.	.	.	.	1	.	.	1	.	.	.	.	T	1
TRIS WOLF	.	.	.	.	.	.	T	.	.	1	.	.	.	.	T	.	2	T	.
FORBS																			
ACHI MILL	.	T	T	T	1	.	.	.	1	T	.	.	T	T	.	.	1	2	2
ACON COLU	.	.	.	.	.	.	1	3	T	1	.	.	.	1	2	.	.	T	.
AGOS GLAU	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.
ANTE CORY	1	.	T	.	.	T	2	.	1	1	.	.	.	.	.	T	1	.	1
ARNI CHAM	T	.	.	1	T	.	.	.	.	.	.	.	.	.	1	.	.	.	.
ASTE FOLI	4	1	1	2	2	2	2	1	1	2	.	T	1	2	3	3	4	2	4
ASTE MODE	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.
CALT LEPT	.	.	.	.	.	.	1	5	.	4	5	.	.	.	.	.	.	.	.
CAST CUSI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	T	.
CIRS IUM	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
DODE JEFF	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	T	.	.
EPIL GLAN	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	T	.	T	.
EQUI ARVE	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
FRAG VIRG	3	2	1	3	1	2	.	1	3	.	1	1	.	2	4	.	.	.	4
GALI TRFI	.	.	.	.	T	T	.	.	.	.	.	.	.	1	.	1	.	.	.
GENT AFFI	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	2	.	.
GEUM MACR	T	T	.	.	T	T	.	.	.	.	.	.	.	T	T	.	.	.	1
LIGU TENU	.	2	.	.	1	.	3	2	2	1	2	.	.	T	1	.	1	1	.
MIMU PRIM	.	.	.	.	.	T	1	.	1	1	1	.	.	.	.	.	.	.	.
PEDI GROE	1	1	2	.	.	T	1	T	2	4	1	.	1	.	T	1	T	.	.
PENS GLOB	T	.	.	.	.	.	.	.	.	.	.	.	.	.	T	T	2	.	T
POLE OCCI	2	2	2	1	1	.	.	T	.	1	.	.	.	1	.	.	.	T	.
POLY BIST	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.
POLY DOUG	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.
POTE DIVE	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1	.	2	T	.
POTE GRAC	.	T	T	.	.	.	T	.	.	.	.	.	.	.	T	.	1	.	.
RANU ACRI	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
RANU ALIS	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
SAXI OREG	.	.	.	.	.	T	.	T	T	1	T	.	.	.	.	T	.	.	.
SELA SELA	.	T	.	.	.	.	.	.	.	T	.	T	1	.	.	.	.	.	.
SENE CYMB	.	.	.	.	.	1	4	1	.	1	.	.	.	.	.	.	.	.	.
SENE INTE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	T	.
SENE PSEU	1	1	1	T	1	2	.	.	T	.	.	.	.	1	4	.	.	1	1
STEL LONG	T	1	.	1	.	T	T	T	T	T	.	.	.	T	T	.	T	1	T
SWER PERE	4	3	2	2	3	1	1	1	2	2	2	1	T	1	.	.	.	.	.
TARX OFFI	.	T	1	T	.	T	.	.	.	T	.	.	1	.	T	.	.	1	1
THAL ALPI	.	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	.	.	.
THAL OCCI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
TRIF LONG	.	T	1	.	.	1	.	1	1	1	.	T	1	T	1	1	1	T	1
VALE EDUL	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
VERO AMER	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
VERO WORM	.	.	.	.	.	.	T	T	.	.	.	.	.	.	.	.	.	.	.

	POFR/DAIN								ARCA	
	RF BTW L1E	PG R2A	PD II L3B	BA L2A	YF L4A	BVL R1A	BVR CMP	PG L1A	FI I R1A	HD I R1B
	139	169	162	36	45	126	103	168	146	158
TREES										
PINU CO O	.	.	.	T	.	.	.	.	.	.
PINU CO R	T	.	.	.	T	1	.	.	.	.
SHRUBS										
ARTH CANA	.	.	.	.	.	.	.	.	4	5
LONI CAER	.	.	.	.	.	.	.	T	.	.
POTE FRUT	5	5	5	3	5	5	4	.	1	1
GRAMINOIDS										
AGRP CANI	1	.	.	1	1	4	1	.	.	3
AGRS SCAB	.	T	.	.	.	.	T	.	.	.
CARX AQUA	.	.	.	.	.	.	.	1	.	.
CARX ATHR	.	2	.	1	.	.	.	1	.	.
CARX PRAE	.	.	1	.	.	.	.	.	2	.
CARX PRAT	T	.	.	.	1	T	.	.	.	.
DANT INTE	4	2	1	.	1	2	4	4	T	T
DESC CESP	4	1	4	.	.	.	.	2	.	.
ELEO PAUC	.	.	.	.	.	.	T	.	.	.
FEST IDAH	.	.	T	.	1	1	T	.	3	1
JUNC BA/L	1	2	2	.	.	.	.	3	1	4
KOEL CRIS	T	.	T	T	1	2	1	.	1	2
LUZU CAMP	.	1	.	.	T	.	1	1	.	.
MELI SPEC	.	.	.	.	.	1	T	.	.	.
MUHL FILI	.	.	.	.	.	.	T	.	.	.
PHLE ALPI	.	.	.	T	.	.	1	T	.	.
POA NEVA	.	.	.	.	.	T	.	.	1	.
POA PRAT	.	.	.	5	4	.	.	.	1	2
STIP OCHI	.	.	.	.	.	1	1	.	.	2
FORBS										
ACHI MILL	1	T	T	2	1	2	1	.	1	1
AGOS GLAU	1	.	.	.	.	1	T	2	.	T
ANTE CORY	3	1	.	.	.	.	.	.	.	.
ANTE MICR	.	.	.	2	T	.	1	1	1	1
ARNI CHAM	.	.	.	1	.	.	.	.	.	.
ASTE FOLI	1	1	1	1	1	.	1	1	.	1
ASTE INTG	.	.	.	.	2	2	.	.	4	.
ASTR ALPI	.	.	.	.	.	.	T	.	.	.
CAST CUSI	1	.	.	.	T	T	1	.	.	.
CIRS IUM	.	1	.	.	1	1	.	.	.	1
EPIL GLAN	.	.	.	.	.	.	T	.	.	.
FRAG VIRG	1	1	.	1	2	2	3	1	1	1
GENT AFFI	2	1	T	.	T	.	.	1	.	.
GEUM MACR	.	.	.	T	.	.	.	.	.	.
GEUM TRIF	.	1	T	T	1	1	2	.	.	.
HORK FUSC	.	.	.	T	2	.	.	.	1	.
LIGU TENU	.	1	.	.	.	.	.	T	.	.
LINA MARK	.	.	.	.	.	.	T	.	.	.
PENS GLOB	2	.	.	.	.	.	.	1	.	.
POLY DOUG	.	.	.	T	.	T	T	.	.	.
POTE DIVE	1	4	.	.	.	.	.	1	.	.
POTE GRAC	1	1	T	2	1	.	T	T	3	T
RANU ALIS	.	.	.	.	.	T	T	.	.	.
SENE INTE	T	.	.	.	.	.	1	.	.	.
SENE PSEU	.	.	.	.	T	.	.	.	.	.
SENE SPHA	.	T	.	.	2	.	.	.	.	.
STEL LONG	T	.	.	T	T	.	T	1	.	.
TARX OFFI	T	1	.	1	T	1	T	T	.	.
TRIF LONG	1	.	.	1	T	1	1	T	.	.
VALE EDUL	1	1	.	.	1	.	.	.	.	.

	ABLA/STAM & MIPE					SACO/CASC		
	HD BRO R3A	HD BRO R2A	FIR TRB -1A	BA R4B	STL ABV	BR L2B	CPH SUM -1C	BVL -4A
	156	157	130	28	75	78	91	123
TREES								
ABIE LA R	1	1	T	.	.	.	.	.
PICE EN O	2	2	.	.	.	.	.	.
PICE EN R	.	1	1	.	.	T	1	.
PINU CO O	.	.	4	.	.	.	.	.
PINU CO R	.	.	T	.	.	1	.	.
SHRUBS								
ALNU INCA	.	.	.	.	6	.	.	.
BETU GLAN	.	.	.	1	.	.	.	.
LEDU GLAN	.	.	.	.	.	1	.	.
LONI CAER	.	.	.	.	.	2	.	T
LONI INVO	.	.	.	2	1	.	.	.
POTE FRUT	.	.	.	T	.	.	.	.
RIBE LACU	1	1	.	.	2	.	.	.
RIBE HUDS	T	1	1	.	.	.	.	.
SALX COMM	.	.	.	.	.	5	7	7
SALX DRUM	.	.	.	.	2	.	.	.
SALX MONT	.	.	.	6	2	1	.	.
SALX PHYL	.	.	.	.	.	T	1	T
SALX WOID	.	.	.	1	.	.	.	.
VACC CAES	.	.	.	.	.	1	.	.
VACC OCCI	.	.	.	.	.	T	T	.
GRAMINOIDS								
AGRS IDAH	.	.	.	.	.	1	.	.
BROM CILI	.	T	.	.	.	.	.	.
CALA CANA	.	T	.	T	1	.	5	1
CARX AQUA	.	.	.	1	.	T	.	.
CARX CUSI	.	.	.	.	.	1	.	.
CARX DISP	.	.	.	5	.	.	.	.
CARX JONE	.	.	.	.	.	1	.	.
CARX MICR	.	.	.	.	T	.	.	.
CARX MURI	.	.	.	.	.	1	.	.
CARX ROST	.	.	.	.	.	.	1	.
CARX SCOP	2	1	1	.	.	1	5	5
DESC CESP	.	.	.	.	.	T	.	.
ELYM GLAU	T	T	1	.	T	.	.	.
GLYC ELAT	.	.	2	.	1	.	.	.
HORD BRAC	.	.	T	.	.	.	.	.
LUZU CAMP	.	.	T	.	.	.	.	.
LUZU PARV	T	T	1	.	.	.	.	.
MUHL FILI	.	.	.	.	.	T	.	.
FORBS								
ACHI MILL	.	.	T	.	T	.	.	.
ACON COLU	1	T	2	1	1	.	.	1
ANGL ARGU	.	.	4	1	.	.	.	.
ANTE CORY	.	.	.	.	.	2	.	.
ARNI AMPL	4	1	.	.	.	.	.	.
ASTE FOLI	1	1	1	1	.	1	T	4
CALT BIFL	.	.	.	.	.	.	.	5
DODE JEFF	1	.	T	.	.	1	.	T
EPIL ANGU	1	.	.	.	.	.	.	.
EPIL GLAN	T	T	1	T	.	.	.	.
EQUI ARVE	3	5	1	.	1	1	.	.
ERIG COUL	T	T	2	.	.	.	.	.
ERIG PERE	.	.	.	.	.	.	.	T
FRAG VIRG	.	1	.	T	T	T	.	.
GALI TRFI	.	.	.	.	.	T	1	.
GALI TRFL	.	T	.	1	1	.	.	.
GEUM MACR	T	.	T	.	1	.	.	.
LIGU TENU	.	.	.	.	.	T	.	T
MINU PRIM	.	.	.	.	.	1	.	.
MITE PENT	T	2	1	3	1	.	.	.
PARN FIMB	.	2	1	.	.	.	.	.
PEDI GROE	.	.	.	.	.	1	.	1
POLE OCCI	T	1	.	1	.	.	.	.
POLY BIST	.	.	.	.	.	.	.	T
POTE DIVE	.	.	.	.	.	T	.	.
PYRL ASAR	.	.	.	1	.	.	.	.
SAXI ARGU	T	3	5	5	.	.	.	.
SAXI OREG	.	.	.	.	.	.	.	1
SENE CYMB	.	.	.	.	.	.	T	2
SENE PSEU	.	.	T	.	T	.	.	.
SENE TRIA	1	2	5	.	2	.	.	T
SMIL STEL	.	T	.	T	.	.	.	.
STEL LONG	.	.	.	.	T	.	.	.
SWER PERE	.	.	.	.	.	1	.	.
TARX OFFI	.	.	T	.	.	.	.	.
THAL OCCI	4	.	.	T	4	.	.	.
TRIF LONG	T	.	1	.	.	.	.	.
VERO WORM	.	.	.	.	.	T	.	.

	BVL L3A	BR L2A	MCK R2A	MF R4A	YF R5A	VL L3A	BVR L3C	KN R3A	BVL -EL	FIR TRB JCT L1A	DA L1B	EL WET MDW -1A	WS L5B	BAN R2A	BVL L1A	WS L6B	BA L1C
	124	77	38	174	43	56	86	105	129	131	110	120	18	95	127	21	25
TREES																	
ABIE LA O	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
PICE EN R	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
PINU CO O	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PINU CO R	.	.	T	.	1	T	.	.	.	.	.	.	.	.	.	.	.
SHRUBS																	
ALNU INCA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
BETU GLAN	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	4
LONI CAER	.	.	.	.	1	1	1	T	.	1	.	2	.	.	.	.	.
LONI INVO	.	1	.	.	1	1	1	1	.	1	.	.	3	3	.	2	1
POTE FRUT	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	2
RIBE LACU	.	.	3	.	2	.	.	.	.	1	.	1	6	1	.	4	.
RIBE HUDS	.	.	.	2	.	.	.	.	.	.	.	.	1	.	.	.	1
SALX COMM	6	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SALX DRUM	4	5	4	2	5	6	5	2	5	1	.	.	5	7	5	1	4
SALX EXME	.	.	.	.	.	.	1	.	T	.	.	.	.	.	.	.	.
SALX GEYR	.	1	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.
SALX MONT	.	5	.	5	.	.	4	T	.	.	.	.	.	.	.	.	.
SALX MYRT	.	5	.	.	6	3	5	5	.	.	8	6	6	2	2	6	3
SALX PHYL	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.
SALX WOID	.	.	6	.	1	2	4	.	1	6	T	5	.	.	.	.	.
GRAMINOIDS																	
AGRP CANI	.	.	.	.	1	.	.	.	1	.	.	.	.	.	4	.	.
AGRS SCAB	.	.	.	.	.	.	.	.	1	.	T	.	.	.	.	.	.
BROM CILI	.	.	.	.	T	.	.	5	1	4	T	.	.	T	.	4	T
CALA CANA	5	3	3	2	4	2	5	5	3	5	7	6	5	6	2	1	4
CARX AQUA	.	T	.	.	.	.	.	2	2	.	T	.	.	.	.	.	2
CARX DISP	.	T	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.
CARX LUZU	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
CARX MICR	.	.	T	T	.	.	.	.	.	.	.	.	.	.	2	1	T
CARX PRAT	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	T	.
CARX ROST	.	.	.	.	.	.	.	2	3	.	1	.	.	.	.	1	1
CARX SCOP	4	5	2	.	.	.	.	.	.	1	.	.	.	.	.	.	.
DESC CESP	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.
GLYC STRI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
HORD BRAC	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.
JUNC BA/L	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.
LUZU CAMP	.	.	.	.	T	T	.	.	.	.	.	.	.	.	.	.	.
LUZU PARV	.	.	T	.	1	.	T	.	.	.	.	.	.	.	.	.	.
PHLE ALPI	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	T
POA LEPT	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
POA PALU	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	T
POA PRAT	.	.	.	.	1	1	.	.	T	.	.	.	.	.	1	.	4
TRIS WOLF	.	.	.	.	T	.	.	.	1	2	.	.	.	.	2	.	.
FORBS																	
ACHI MILL	1	.	1	T	T	T	T	.	1	1	T	.	.	.	1	1	T
ACON COLU	1	.	.	.	.	1	1	1	.	1	.	T	.	T	.	.	.
ANGL ARGU	.	.	.	1	.	.	.	.	.	.	.	.	.	2	.	.	1
ARNI CHAM	.	.	.	.	T	.	.	.	.	.	.	.	.	.	1	.	1
ASTE FOLI	2	.	.	.	2	2	2	3	2	2	1	2	.	2	5	.	4
ASTE MODE	.	T	.	.	.	T	.	2	1	T	T	.	.	.	.	.	.
CALT BIFL	1	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.
CAST CUSI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.
CAST MINI	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.
CIRS IUM	.	.	.	.	.	.	1	T	.	.	.	.	.	.	.	.	.
DODE JEFF	.	.	.	.	.	.	T	.	.	.	.	.	.	T	.	.	.
EPIL ANGU	1	.	.	1	T	.	.	.	.	1	.	.	2	2	.	.	.
EPIL GLAN	1	.	.	T	.	.	.	T	.	.	1	.	.	.	.	.	.
EQUI ARVE	.	1	.	.	1	1	T	T	T	1	.	.	.	1	T	.	4
ERIG COUL	.	.	.	.	1	.	T	.	.	2	.	.	.	.	.	.	1
FRAG VIRG	.	.	2	.	2	2	.	.	1	2	.	1	.	T	.	2	1
GALI TRFI	1	1	.	.	.	.	.	1	1	.	2	.	.	T	.	.	.
GALI TRFL	.	.	.	1	2	.	.	.	.	.	.	.	.	T	.	.	.
GEUM MACR	.	.	1	T	1	1	.	2	2	1	T	T	1	.	.	1	1
LIGU TENU	.	.	.	.	T	T	T	.	.	.	.	1	.	.	.	.	.
MERT CILI	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	T	.
MITE PENT	T	.	T	.	.	.	.	.	.	T	T	.	.	.	.	.	T
PARN FIMB	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.
PEDI GROE	.	.	.	.	T	1	T	.	T	.	.	.	.	.	T	.	.
PENS GLOB	.	.	.	.	.	.	.	T	1	.	.	T	.	.	1	.	.
POLE OCCI	1	.	.	.	.	1	T	3	2	1	2	.	.	T	1	.	T
POLY BIST	T	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.
POTE GRAC	.	.	.	.	.	.	.	.	1	.	.	.	.	.	2	.	.
SAXI ARGU	.	.	T	1	.	.	T	.	.	.	.	.	.	.	.	.	.
SAXI OREG	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
SENE INTE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.
SENE PSEU	.	.	.	.	.	1	T	.	.	1	T	.	.	.	.	.	.
SENE TRIA	4	.	T	.	T	.	1	.	T	2	T	.	.	T	.	.	.
SMIL STEL	.	.	.	.	2	1	.	T	.	T	.	.	.	.	.	4	.
SOLI CANA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	1
STEL LONG	T	.	.	.	T	.	.	1	.	.	T	.	.	.	.	.	.
SWER PERE	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
TARX OFFI	.	.	T	.	T	1	.	T	T	.	.	.	.	.	T	.	1
THAL OCCI	2	T	.	.	1	1	.	1	T	4	.	.	4	4	.	1	T
TRIF LONG	.	.	1	.	1	.	.	.	.	T	.	.	.	.	T	.	.
URTI DIOC	.	.	.	2	.	.	.	.	.	.	.	.	4	.	.	.	.
VERO WORM	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.

	SAMY/POPR										SAGE/CACA								
	BA L1B	FI I L3A	WS L4A	HO L1A	HO R2B	SL R4B	BA L1A	LC L2C	LC R1A	YF L3A	FK I L1A	VL R1A	ST L4B	MR L3C	BA R4F	YF MCK	BA L4B	PCM C	SL L3A
	24	143	15	1	3	14	23	11	12	47	140	52	60	98	32	41	34	161	7
TREES																			
PICE EN O	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PICE EN R	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SHRUBS																			
ALNU INCA	.	.	.	5	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BETU GLAN	4	.	4	.	.	5	.	.	.	.	5	6	.	.	.	.	.	.	5
LONI CAER	.	.	.	.	.	.	.	.	.	.	1	.	4	2	1	.	.	.	.
LONI INVO	.	.	2	.	.	1	.	.	.	.	.	.	1	.	.	.	.	.	.
POTE FRUT	2	.	.	.	.	.	1	.	.	.	.	.	.	.	T	.	.	.	.
RIBE LACU	.	5	3	1	3	2	.	.	.	.	.	1	1	2	T	.	1	1	1
RIBE HUDS	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ROSA WOOD	.	.	.	1	2	.	.	.	T	.	.	.	.	.	.	.	.	.	4
SALX DRUM	.	7	4	.	.	.	4	.	.	T	.	.	.	.	.	.	.	.	.
SALX GEYR	.	.	.	5	2	4	2	.	.	.	6	6	7	7	7	7	7	7	4
SALX MYRT	7	.	5	5	5	5	1	5	6	7	T	1	.	.	.	.	.	.	2
SALX WOID	.	.	.	.	.	.	.	.	.	.	1	.	T	1	1	.	.	.	.
SHEP CANA	.	.	.	.	.	.	.	2	1	.	.	.	.	.	.	.	.	.	.
GRAMINOIDS																			
AGRP CANI	.	T	.	.	.	T	.	.	.	4	.	.	.	.	4	.	1	T	.
AGRS SCAB	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	T	.
BROM CILI	.	3	.	.	.	.	1	.	1	.	1	1	.	5	1	.	.	1	.
CALA CANA	1	1	.	.	.	.	.	.	.	.	6	5	4	6	4	3	.	.	T
CARX AQUA	2	T	.	.	.	.	2	.	.	.	1	1	.	.	1	.	.	.	.
CARX ATHR	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.
CARX CUSI	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CARX DISP	.	.	.	1	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
CARX JONE	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.
CARX LANU	1	.	1	.	.	.	2	.	.	.	.	1	.	.	.	.	.	.	4
CARX MICR	T	1	.	.	.	.	1	2	.	.	.	.	.	.	.	1	1	.	1
CARX PRAT	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.
CARX ROST	4	1	.	.	.	1	.	1	.	T	1	T	.	.	1	.	.	.	2
CARX SCOP	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ELYM GLAU	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GLYC STRI	2	.	.	3	1	.	.	.	.	.	.	1	.	.	.	.	1	.	.
HORD BRAC	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
JUNC BA/L	1	.	T	1	.	.	4	5	.	.	.	.	.	.	.	.	.	.	2
LUZU CAMP	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.
LUZU PARV	1	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
MELI SPEC	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.
MUHL FILI	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
PHLE ALPI	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
POA NEVA	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.	.
POA PALU	T	.	.	.	T	.	1	.	.	4	.	1	.	.	4	.	1	.	.
POA PRAT	3	5	1	1	1	6	5	5	5	2	.	1	1	T	1	1	6	T	2
TRIS WOLF	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FORBS																			
ACHI MILL	T	1	T	T	.	T	2	.	T	T	.	.	T	T	1	2	1	T	1
ACON COLU	.	.	.	.	.	.	.	.	.	.	.	.	.	T	T	.	.	.	.
ANGL ARGU	T	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
ANTE CORY	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	1	.	.	.
ARNI CHAM	T	T	.	.	.	.	T	.	.	.	.	T	.	T	T	.	T	.	.
ARTM LUDO	.	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.	.	.
ASTE FOLI	4	1	2	1	T	5	4	T	5	1	.	2	2	1	2	3	4	.	1
ASTE MODE	.	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
CAST MINI	.	.	.	.	.	T	.	1	2	.	.	.	.	.	.	.	.	.	T
CIRS IUM	.	.	T	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
EPIL ANGU	.	.	1	.	.	.	.	.	.	.	.	T	.	.	.	.	.	.	.
EPIL GLAN	T	.	.	T	T	.	.	T	.	.	.	1	1	.	.	.	.	.	.
EQUI ARVE	5	.	4	T	.	.	5	5	7	T	.	T	.	.	T	.	.	.	6
ERIG COUL	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1	.	T	.	.
FRAG VIRG	1	.	1	.	.	T	1	.	.	.	.	.	T	1	T	5	1	.	.
GALI TRFI	1	.	.	.	.	T	.	.	.	.	.	T	.	.	T	.	1	.	.
GALI TRFL	.	.	.	.	.	T	.	.	.	.	.	.	.	.	T	.	.	.	.
GENT AFFI	.	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
GEUM MACR	1	.	1	1	1	1	1	.	T	T	.	1	T	1	1	1	3	1	T
MERT CILI	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.
MIMU GUTT	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
PENS GLOB	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	T	.	.	.
POLE OCCI	T	.	2	T	.	4	.	.	.	.	.	.	.	.	2	.	T	.	T
POTE GRAC	1	T	.	T	.	.	1	.	.	.	.	.	.	1	.	.	1	.	.
PYRL ASAR	.	.	.	T	.	1	.	T	1	.	.	.	.	.	.	.	.	.	T
SENE PSEU	T	.	T	1	.	.	T	.	.	.	1	1	T	2	1	1	1	.	.
SENE SPHA	.	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SMIL STEL	.	.	1	T	.	T	.	.	.	.	.	T	.	.	.	.	.	2	5
SOLI CANA	T	.	.	.	.	.	.	.	.	T	.	2	.	.	1	.	.	.	T
STEL LONG	.	.	.	.	.	.	T	1	T	T	.	.	T	.	1	1	1	T	.
TARX OFFI	1	1	T	T	.	T	1	1	4	.	.	T	.	1	1	1	1	.	.
THAL OCCI	.	1	T	T	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
TRIF LONG	.	.	.	T	.	.	1	.	.	.	.	.	T	.	.	1	1	.	.
URTI DIOC	.	.	.	T	3	.	.	.	.	.	.	.	.	.	.	.	.	4	.
VERO AMER	T	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

ALIN-COST

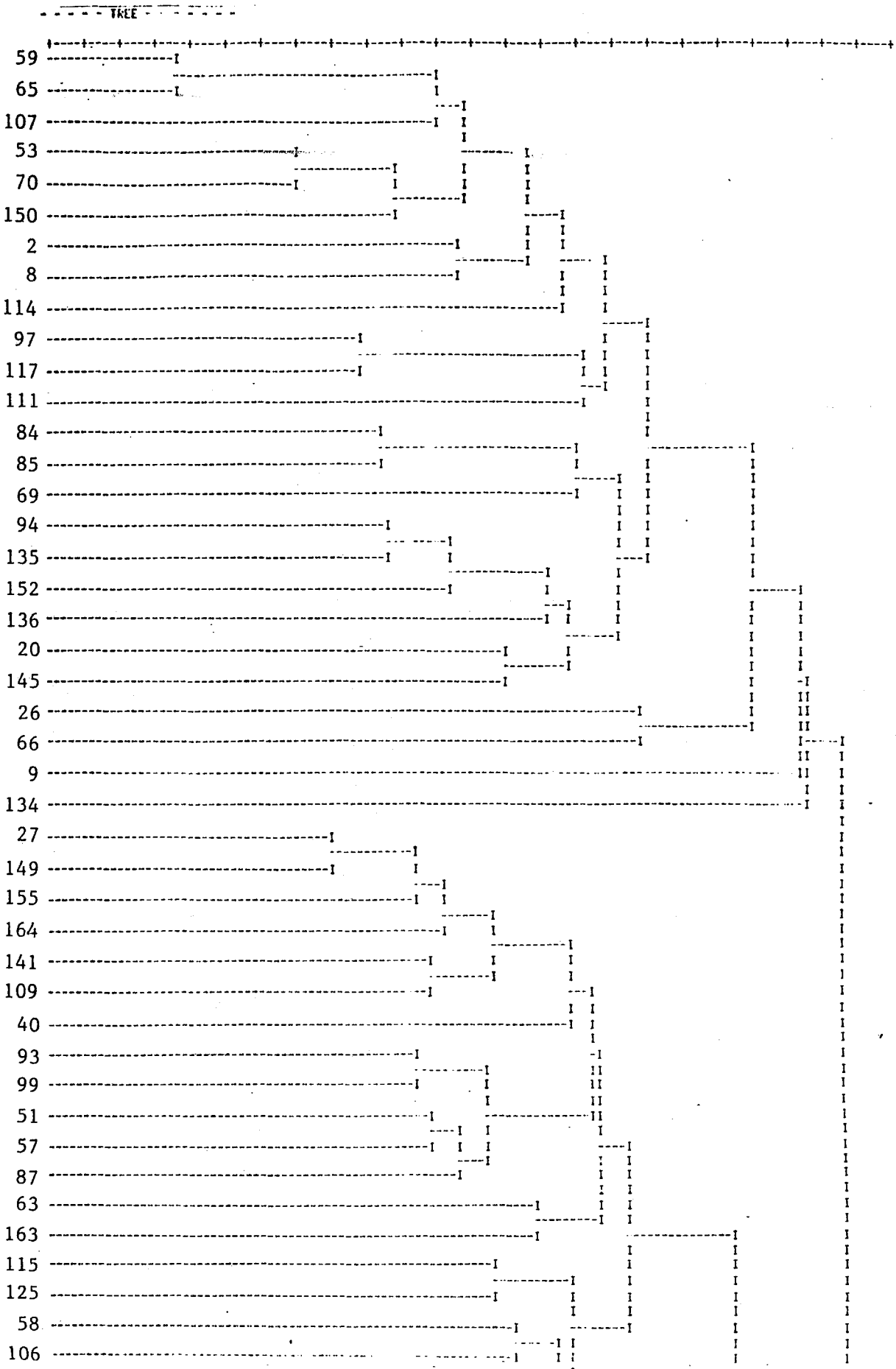
	YF R3A	SA SL R1A	YF L1A	WS L1A	WS LSC	MF R3A	SL L1A	MR CAN R3A	WS L4C
	46	4	48	22	19	175	5	171	17
TREES									
ABIE LA R	.	.	.	.	.	T	.	.	.
PICE EN O	.	.	.	.	.	.	.	.	5
PICE EN R	.	.	.	.	.	.	.	.	3
PINU CO O	.	.	.	.	.	.	.	.	5
SHRUBS									
ALNU INCA	6	4	7	2	6	5	8	8	5
AMEL ALNI	.	.	.	.	.	2	.	.	.
CORN STOL	.	7	7	8	4	4	2	.	.
LONI INVO	.	.	.	.	.	T	.	.	2
POTE FRUT	.	.	.	.	.	.	.	.	1
RIBE LACU	.	1	1	T	2	T	1	1	1
RIBE HUDS	.	.	.	T	1	.	.	.	.
ROSA WOOD	.	1	.	1	.	.	1	.	.
SALX DRUM	1	.	.	.	.	1	.	.	1
SALX EXME	.	.	.	.	.	1	.	.	.
SALX MYRT	3	.	.	.	.	.	T	.	.
GRAMINOIDS									
AGRP CANI	1	.	.	.	.	.	1	.	.
AGRS SCAB	.	.	.	.	.	.	5	.	.
CALA CANA	1	.	.	1	6	1	.	.	2
CARX ATHR	T	.	.	.	.	.	.	.	.
CARX DISP	.	.	.	.	.	.	.	.	T
CARX MICR	.	.	.	.	T	.	T	.	.
CARX PRAT	T	.	.	.	.	.	.	.	.
JUNC BA/L	.	.	.	.	T	.	.	.	.
LUZU PARV	.	.	.	.	.	.	.	.	1
POA PALU	2	.	.	.	.	.	1	.	.
POA PRAT	2	.	.	.	.	.	.	.	.
FORBS									
ACHI MILL	T	.	.	.	.	.	.	.	.
ANGL ARGU	.	.	.	1	1	1	T	.	.
ANTE MICR	T	.	.	.	.	.	.	.	.
ARTH LUDO	1	.	.	.	.	.	.	.	.
ASTE FOLI	2	.	.	.	1	1	6	.	.
ASTE MODE	.	.	.	.	5	2	.	.	.
DODE JEFF	.	.	.	.	.	1	.	.	T
EPIL ANGU	.	.	.	.	.	.	1	.	1
EPIL GLAN	.	.	.	.	T	.	1	.	.
EQUI ARVE	.	.	.	1	T	.	T	.	1
FRAG VIRG	.	.	.	.	.	T	.	.	1
GALI TRFL	.	.	.	T	2	T	1	4	.
GEUM MACR	.	.	.	T	.	.	2	.	.
PARN FIMB	.	.	.	.	.	.	.	.	1
POLE OCCI	.	.	.	.	.	.	.	.	T
POTE GRAC	T	.	.	.	.	.	.	.	.
SENE TRIA	.	.	.	.	.	T	.	.	.
SMIL STEL	.	1	.	T	T	.	.	.	3
SOLI CANA	1	.	.	.	.	T	.	.	.
STEL LONG	T	.	.	.	.	.	.	.	.
SWER PERE	.	.	.	.	.	.	.	.	1
TARX OFFI	T	.	.	.	.	.	.	.	.
THAL OCCI	.	.	.	.	1	1	.	.	1
URTI DIOC	1	.	.	1	.	.	1	.	.

Miscellaneous Plots

	BA L4A	BA R4C	BA R4D	BA R4G	BA L3A	WS L5A	ST L5A	EL WET MDW -2C	WS MDW L1C
	26	29	30	33	35	49	58	119	166
TREES									
ABIE LA O	.	.	.	.	3	.	.	.	.
PICE EN O	.	.	.	.	.	7	.	.	.
PINU CO O	.	.	.	6	4	.	.	.	.
PINU CO R	.	.	.	4	1	.	.	.	.
SHRUBS									
ALNU INCA	.	.	.	.	T	1	.	.	.
BETU GLAN	.	5	.	.	3	.	.	.	.
LONI CAER	.	2	.	1	1	.	1	.	.
LONI INVO	.	2	.	1	2	1	.	.	.
POTE FRUT	.	.	.	.	5	.	.	.	.
RIBE LACU	.	4	.	T	.	T	1	.	.
RIBE HUBS	.	.	.	.	.	1	.	.	.
SALX DRUM	.	1	.	.	.	.	.	.	.
SALX GEYR	.	3	.	.	.	.	.	.	.
SALX MONT	.	4	.	.	.	.	.	.	.
SALX MYRT	.	5	.	.	5	.	.	.	1
SALX WOID	.	T	.	.	1	.	7	.	5
SHEP CANA	.	.	.	.	2	.	.	.	.
GRAMINOIDS									
AGRP CANI	.	.	.	.	2	.	1	.	.
ALOP AEQU	.	.	T	.	.	.	.	.	.
BROM CILI	.	.	.	.	T	.	1	.	.
CALA CANA	.	.	.	.	.	7	.	.	.
CARX AQUA	6	.	.	.	.	.	.	1	2
CARX ATHR	.	.	.	.	.	.	T	.	.
CARX CUSI	.	.	.	.	.	.	.	.	2
CARX DISP	.	.	.	T	.	.	.	.	.
CARX LANU	.	.	.	.	.	.	4	.	.
CARX LUZU	.	.	.	.	.	.	.	1	.
CARX MICR	T	.	.	.	T	.	T	T	.
CARX ROST	.	.	1	.	.	.	.	2	.
DESC CESP	.	.	.	.	.	.	T	5	2
ELEO PAUC	1	.	6	.	.	.	.	.	.
HORD BRAC	.	.	.	.	.	.	T	.	T
JUNC BA/L	.	.	.	T	.	.	T	.	5
LUZU CAMP	.	.	.	.	.	.	.	1	.
LUZU PARV	.	.	.	.	T	.	.	.	.
MUHL FILI	2	.	.	.	.	.	1	5	.
PHLE ALPI	T	.	.	.	1	.	.	T	.
POA PALU	.	.	.	.	2	.	T	.	.
POA PRAT	1	T	.	1	1	.	1	.	1
TRIS WOLF	.	.	.	.	.	.	1	T	.
FORBS									
ACHI MILL	1	.	.	T	T	.	1	.	.
AGOS GLAU	.	.	.	.	.	.	.	1	.
ANTE CORY	.	.	.	1	.	.	1	.	.
ANTE MICR	.	.	.	1	.	.	.	.	.
ARNI CHAM	.	.	.	.	1	.	.	T	1
ARTH LUDO	.	.	.	.	1	.	.	.	.
ASTE FOLI	T	.	.	4	2	.	2	.	1
ASTE OCCI	.	.	.	.	.	.	.	4	.
CAST CUSI	.	.	.	.	.	.	.	2	.
CAST MINI	.	.	.	.	.	.	.	.	1
CIRS IUM	.	.	.	.	T	.	T	.	.
DODE JEFF	.	.	.	.	.	.	.	1	.
EPIL ANGU	.	T	.	T	.	.	.	.	.
EPIL GLAN	.	.	.	.	1	.	.	T	.
EQUI ARVE	T	.	.	5	T	.	.	.	.
ERIG COUL	.	.	.	.	T	.	.	.	.
FRAG VIRG	T	1	.	4	T	.	2	.	.
GALI TRFI	.	.	1	.	.	.	.	.	.
GALI TRFL	.	T	.	.	.	.	.	.	.
GENT AFFI	.	.	.	T	.	.	T	T	.
GEUM MACR	.	.	.	.	1	.	1	.	.
LIGU TENU	.	.	.	.	.	.	.	1	.
MIMU GUTT	.	.	.	.	T	.	.	.	.
MIMU PRIM	4	.	.	.	.	.	.	2	.
PEDI GROE	.	.	.	.	.	.	.	2	1
PENS GLOB	.	.	.	.	.	.	T	T	.
POLY BIST	.	.	.	.	.	.	.	1	.
POTE GRAC	.	.	.	.	.	.	1	.	.
PYRL ASAR	.	1	.	.	.	.	.	.	.
RANU ALIS	.	.	.	.	.	.	.	T	.
SENE CYNB	.	.	.	.	.	.	.	3	.
SENE INTE	.	.	.	.	.	.	.	1	.
SENE PSEU	.	T	.	.	.	.	1	.	.
SENE SPHA	.	.	.	.	.	.	.	.	T
SHIL STEL	.	1	.	.	.	4	T	.	.
SOLI CANA	.	.	.	.	T	.	.	.	.
STEL LONG	T	.	.	.	1	.	T	.	1
TARX OFFI	T	.	.	1	1	.	.	.	T
THAL OCCI	.	.	.	.	.	T	.	.	.
TRIF LONG	1	.	.	2	T	.	T	.	.
VALE EDUL	.	.	.	.	.	.	T	.	.
VERO AMER	.	.	.	.	T	.	.	.	.

APPENDIX D

FLORISTIC CLUSTAR DENDOGRAM


TREE
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APPENDIX E

SOIL, ENVIRONMENTAL AND HYDROLOGIC PARAMETERS OF PLOTS

Summary of environmental, soil and hydrologic parameters of sample plots.

Plot	Subgroup Taxa (Abbr) (1)*	Fam (2)	Sl % (3)	Elev (ft) (4)	Rel Pos (5)	gwl (cm) (6)	CF (cm) (7)	X pH (8)	X cf (9)	Abbreviated Pedon Description Horizon(Thickness)Texture-%Coarse Frag (10)	AWC % (11)	Dr cl (12)	Per cl (13)	IE cl (14)	Er cl (15)	HSG (16)
AGSC-BAR(GRAVEL)																
44	Aq Cryofluvent	fr	3	6780	1	33	30		70	C(33)ls-60	4	p	vr	l	sv	C
61	Ty Cryaquent	ssk	2	6580	1	16	0	6.6	50	O(5)L,C(20)ls-50	9	vp	vr	l	n	D
81	Ty Cryaquent	fr	3	6820	1	10	0	6.4	55	C(25)s-25	3	vp	vr	l	sv	D
142	Aq Cryofluvent	fr	0	6680	1	35	14	6.6	50	C(14)s-65,C(21)s-20	4	p	ex	l	sv	C
147	Aq Cryofluvent	fr	0	7470	1	40	25	6.6	75	C(40)s-75	3	sp	vp	l	vsv	C
165	Ty Cryofluvent	fr	3	7305	1	35	30	6.6	65	C(35)ls-65	4	p	vr	l	sv	C
167	Aq Cryofluvent	ssk	2	7330	1	30	20		60	C(30)s-65	4	p	vr	l	sv	C
176	Aq Cryofluvent	fr	0	5800	1	25	8	6.4	69	C(8)s-35,C(17)s-75	3	p	vr	l	sv	C
AGSC-BAR(SAND)																
128	Ty Cryaquent	s	0	6357	1	10	5		5	C(5)s-50,IIA(5)s,IIC(15)s	5	p	ex	l	sv	D
154	Aq Cryofluvent	s	0	7500	1	55	20	6.2	0	C(30)ls,IIO(5)F,IIC(11)ls,IIIO(14)F	11	p	r	l	sv	C
173	Aq Cryofluvent	ssk	0	6220	1	25	5	6.5	37	C(5)s,IIA&C(11)sl,IIC(19)s-55	5	p	r	m	sv	D
177	Aq Cryofluvent	s	0	6360	1	25	5	6.7	0	C(5)s,IIA&C(35)s	6	p	r	l	sv	C
178	Aq Cryofluvent	s	0	6490	1	51	23	6.6	0	O&C(8)s,IIC(15)s,IIIO(11)F,IIIC(9)s	14	sp	r	m	n	C
ELPA																
37	He Borofibrist		3	8710	1	0	0	6.0	0	O(110)F,O(50)H	30	vp		l	n	D
50	Hi Cryaquoll	fsi	0	6500	3	0	0	6.4	0	O(13)F,A(12)sil	24	vp	s	l	n	D
64	Te Borosaprist		2	6420	2	0	0		0	O(30)F	30	vp		l	n	D
73	Ty Cryaquent	fl	1	6770	2	0	0	6.0	0	O(8)F,C(10)sil,C(7)scl	22	vp	ms	l	n	D
90	Te Borohemist	l	3	7290	1	0	0	6.6	0	O(40)F,A(11)sil,C(5)sl	30	vp	m	l	n	D
100	Ty Cryaquent	fl	0	6665	1	0	0	6.1	14	O(10)F,A(10)sil,C(10)sicl	22	vp	s	l	n	D
118	Te Borohemist	fl	3	6480	1	0	0	6.3	0	O(56)H,C(5)s	30	vp		l	n	D
132	Aq Cryofluvent	ssk	1	7150	2	25	0	6.7	35	A(1)sl,AC(10)ls-25,C(30)s-55	7	p	r	m	n	D
138	Ty Cryaquent	l	4	6820	1	0	0	6.0	0	O(20)H,P(20)S,A(5)sicl,A(6)sil,C(14)ls	30	vp	s	l	n	D

* Parameters and abbreviations are defined on final page of table.

Plot	Subgroup Taxa (Abbr) (1)*	Fam (2)	Sl % (3)	Elev (ft) (4)	Rel Pos (5)	gwl (cm) (6)	CF (cm) (7)	X pH (8)	X cf (9)	Abbreviated Pedon Description Horizon(Thickness)Texture-%Coarse Frag (10)	AWC % (11)	Dr cl (12)	Per cl (13)	IE cl (14)	Er cl (15)
CARO															
8	Ty Cryaquent	col	0	5940	2	0	0	7.6	0	A(10)l,C(15)sl	13	vp	m	l	r
9	Ty Cryaquent	lsk	6	6600	3	0	0		32	O(10)H,C(15)sl-40	18	vp	mr	l	r
20	Te Borohemist	s	1	6270	2	10	0		0	O(25)H	30	vp		l	n
53	Aq Cryofluvent	fl	2	6300	1	53	0	6.1	0	A(42)sil,IIO(11)H	20	p	m	l	m
59	Ty Cryaquent	s/f	1	6580	2	10	0	6.6	0	O(10)F,C(5)l,C(10)ls	19	vp	m	l	n
65	Aq Cryorthent	ssk	1	6515	2	43	36	6.5	10	A(7)l,A(7)sl,C(9)sl,C(13)ls-10,C(7)ls-45	10	sp	mr	m	m
69	Aq Cryofluvent	s	0	6515	2	57	16	6.4	11	O(2)L,A(4)sl,IIA(6)l,IIC(6)sl,IIC(41)ls	9	sp	mr	l	m
70	Aq Cryoboroll	col	2	7530	1	76	62	5.9	0	A(12)l,A(7)sl,IIA(35)sil,IIC(8)sl,IIIC	15	sp	m	m	m
84	Ty Cryaquent	col	0	6770	1	0	0	6.2	t	C(25)sl	16	vp	mr	l	sv
107	Te Borohemist	fl	1	6830	2	0	0	6.4	0	O(25)F,O(17)H	30	vp		l	n
114	Flaq Borosaprist	col	1	6380	1	5	0	6.5	0	O(43)F,C(5)sl,O(13)S	30	vp		l	n
134	Aq Cryofluvent	col	2	7140	2	45	34	6.5	0	A(13)sil,C(10)sl,IIO(11)F,IIC(26)ls	18	sp	m	m	n
150	Ty Cryaquent	fl	4	7230	2	10	0	6.6	2	O(26)S	30	vp		l	n
SALIX/CARO															
2	Ty Cryaquent	fl	2	5820	1	7	0	6.0	0	O(18)F,C(7)l	26	vp	m	l	r
66	Aq Cryofluvent	ssl	0	6520	2	50	40	6.5	9	A(8)l,IIO(4)H,IIC(34)s-10,IIIC(4)l	10	sp	mr	m	r
85	Ty Cryaquoll	col	2	6770	2	33	0	6.2	2	A(15)l,A(23)sil	18	p	m	m	m
94	Ty Cryaquent	s	1	6890	1	18	0	6.0	t	O(18)H,A(10)sicl	27	vp	ms	l	n
97	Aq Cryorthent	lsk	2	6610	3	64	0	6.1	15	O(25)H,A(16)l,C(20)scl-35,C(23)scl-12	20	p	ms	l	r
111	Te Borohemist	fl	2	6395	2	109	53	6.4	0	O(13)S,A(5)l,O(30)H,A(5)sil,O(23)F,A(11)	26	sp	ms	l	r
117	Cu Cryaquoll	col	2	6480	2	53	0	5.7	2	O(13)H,A(48)sil,AC(8)scl	21	p	m	l	r
135	Te Borofibrist	s	4	6870	1	0	0	6.4	0	O(55)F,C(20)sl	30	vp		l	r
136	Aq Cryoboroll	col	4	6870	1	55	0	6.1	t	A(12)l,A(7)sil,IIO(4)S,IIA(24)sil	18	p	ms	l	r
145	Ty Cryaquent	l	2	6990	3	0	0	6.3	t	O(10)H,O(20)S,C(20)l	30	vp	m	m	r
152	Aq Cryofluvent	col	2	7500	1	45	0	6.2	0	A(40)sl,C(20)sl	11	p	mr	m	r
SACO/CASC															
78	Ty Cryaquent	col	2	6860	2	23	0	6.7	11	O(15)S,O(8)H,C(18)sl-20	28	p	m	l	r
91	Te Borosaprist	col	2	7290	2	0	0	6.0	0	O(48)H,A(5)sil,O(10)S,C(8)sl.	30	vp	m	l	r
123	Aq Cryorthent	fl	4	6915	3	58	0	6.8	0	O(30)H,A(13)sil,C(15)sicl	24	p	ms	l	r

* Parameters and abbreviations are defined on final page of table.

Plot	Subgroup Taxa (Abbr) (1)*	Fam (2)	Sl % (3)	Elev (ft) (4)	Rel Pos (5)	gwl (cm) (6)	CF (cm) (7)	X pH (8)	X cf (9)	Abbreviated Pedon Description Horizon(Thickness)Texture-%Coarse Frag (10)	AWC % (11)	Dr cl (12)	Per cl (13)	IE cl (14)	Er cl (15)	HSG (16)
SAWO/SWPE																
27	Te Borohemist	fl	9	6220	3	52	10	6.4	0	O(42)H,O(10)F	30	p		m	n	D
40	Hi Cryaquoll	fl	7	7510	3	0	0	6.4	4	O(7)H,A(8)sicl,A(10)cl	21	p	s	l	n	D
57	Te Borohemist	fl	2	6500	2	54	0	6.4	0	O(61)H	30	vp		l	n	D
63	Te Borofibrist	fl	3	6420	3	80	55		0	O(24)H,O911)S,O(11)F,O(24)H,O(10)F	30	vp		l	n	D
87	Ty Cryaquoll	lsk	14	6540	3	41	0	6.0	8	O(13)S,A(20)sil,AC(19)scl-15	22	p	mr	m	n	C
93	Ty Cryaquoll	s	0	6915	1	51	0	6.3	9	A(23)sil,IIC(13)s-20,IIIA(2)l,IIIC(13)ls	12	sp	m	m	n	C
99	Ty Cryaquent	fl	3	6620	3	41	0	6.2	0	O(15)H,A(13)l,C(30)sil	22	p	l	m	n	D
106	Ty Cryaquoll	f	4	6800	3	41	0	5.6	t	O(25)S,A(16)sil,A(15)sicl	25	p	s	l	n	D
109	Aq Cryofluvent	col	3	6330	1	61	0	6.2	0	O(18)S,A(10)l,C(33)sl	26	p	m	l	m	C
141	Ty Cryaquent	lsk	2	6680	1	10	0	6.5	8	O(13)H,C(17)sl,IIA&C(10)sl	21	vp	m	l	n	C
149	Ty Cryaquent	l	5	7320	1	18	0	6.6	2	O(9)H,O(6)S,C(3)sil,IIO(14)H	30	vp		l	n	D
155	Te Borofibrist	l	4	7500	3	15	0	5.9	0	O(45)H,O(4)S,O(29)F	30	vp		l	n	D
159	Ty Cryaquent	l	0	7350	2	70	0	5.9	t	O(31)F,A(10)sil,C(9)sicl,IIA(13)l,IIC(7)	22	sp	s	l	n	D
163	Ty Cryaquent	ssk	3	7310	2	70	0	6.0	16	O(38)H,C(32)sl-35	19	p	m	l	n	D
164	Aq Cryofluvent	fr	2	7310	2	45	0	6.3	33	O(9)S,C(11)sl,IIA(10)l-15,IIC(15)ls-75	18	p	m	l	n	D
MIPE																
28	Ty Cryaquent	fl	65	6240	4	0	0	6.6	0	O(10)F,O(15)S	30	vp		l	n	D
75	Aq Cryofluvent	lsk	12	6760	4	45	0	5.9	22	O(5)H,A(13)l,C(27)l-35	15	sp	m	l	m	C
130	Ty Cryaquent	fr	5	6600	1	8	0	5.9	55	O(1)F,C(2)s,IIO(5)S,IIC(17)s-65	10	p	ex	l	sv	D
157	Ty Cryaquent	col	4	7580	3	40	0	6.3	7	O(8)S,C(7)ls,IIO(15)S,IIC(4)sl,IIIA(5)l	23	p	m	l	n	D
156	Aq Cryofluvent	ssk	3	7600	1	58	40	6.7	32	A(10)ls,C(18)ls-45,C(26)ls-25,C(6)sl-10	5	sp	r	l	n	C
PICO/VAOC																
51	Ty Cryochrept	ssk	2	6500	2	75	60	6.4	35	O(13)F,B(7)sicl,IIC(4)ls-30,IIC(45)ls-55	12	sp	s	l	n	C
67	Aq Cryofluvent	s	1	6530	2	48	10	6.3	0	A(10)sil,AC(9)sl,C(24)ls,IIO(5)H	14	p	m	l	n	C
68	Ty Cryaquent	fl	1	6520	2	0	0	6.4	12	O(4)F,O(3)S,A(4)l,C(14)l	21	vp	m	l	n	D
76	Aq Cryofluvent	lsk	2	6460	1	37	16	6.4	24	O(5)F,C(4)s,IIA(7)sl,IIC(21)s-35	13	sp	mr	l	m	C
89	Aq Cryofluvent	col	7	7290	2	76	0	5.7	9	O(15)F,A(21)scl-10,C(22)sl-20,C(23)sil	17	sp	m	l	n	C
102	Aq Cryoboroll	col	1	6670	2	48	28	6.6	4	A(18)l,A&C(10)l,C(33)ls-10	13	p	m	m	n	C
108	Te Borohemist	col	3	6830	2	46	0	6.1	0	O(25)F,O(21)H,C(12)l,IIC(16)sil,IIC.	30	p		l	n	D
121	Flaq Borosaprist		1	6470	2	96	0	6.2	0	O(10)H,O(18)F,O(25)S,A(5)l,IIO(3)S,IIA	23	sp	m	l	n	D
133	Aq Cryoboralf	s	1	7150	2	70	45	6.6	20	O(5)L,A(10)ls,B(10)sl,C(20)ls-20	8	sp	mr	l	n	C
137	Aq Cryorthent	lsk	4	6820	2	55	0	6.4	17	O(12)H,A(6)l,C(17)l-15,C(20)l-35	18	p	m	l	n	C

* Parameters and abbreviations are defined on final page of table.

Plot	Subgroup Taxa (Abbr) (1)*	Fam (2)	Sl % (3)	Elev (ft) (4)	Rel Pos (5)	gwl (cm) (6)	CF (cm) (7)	X pH (8)	X cf (9)	Abbreviated Pedon Description Horizon(Thickness)Texture-%Coarse Frag (10)	AWC % (11)	Dr cl (12)	Per cl (13)	IE cl (14)	Er cl (15)	HSG (16)
JUBA																
62	Ty Cryorthent	f	4	6480	1	110	100	6.8	0	O(9)F,A(24)c,AC(31)c-15,C(36)c-18	17	mw	vs	h	m	C
104	Aq Cryofluvent	col	5	6550	2	51	38	6.3	8	O(8)F,A(12)sil,A(13)sl-15,AC(5)l,IIA(8)	17	sp	s	l	n	C
112	Aq Cryoboroll	col	2	6380	2	76	60	6.3	0	O(10;S,O(23)scl,C(41)sl,C(17)ls	16	sp	ms	l	n	C
151	Ty Cryaquoll	col	5	7230	2	15	0	6.5	20	O(10)H,A(20)sil-20	20	vp	u	l	n	D
160	Aq Cryorthent	col	2	7350	2	65	35	6.2	16	O(9)F,O(8)S,A(9)l,AC(9)l,C(30)sil-30	16	sp	u	l	n	C
SAUR/CACA																
18	Aq Cryofluvent	col	3	6260	2	43	20		0	O(6)L,O(7)H,C(5)s,IIO(8)S,IIC(23)l	21	sp	mr	l	n	C
21	Aq Cryofluvent	s	2	6270	2	76	31		0	A(11)sl,,C(8)s,IIC(8)sl,IIIC(4)sl,IVC	13	sp	mr	m	n	B
25	Aq Cryofluvent	col	2	6090	1	45	22	6.8	0	A(10)l,C(12)s,C(23)sl	11	sp	m	m	n	C
38	Aq Cryofluvent	ssk	6	6210	1	95	70	6.6	23	A(14)sl,IIA(4)sl,IIC(5)ls,IIIA(10)l	8	mw	mr	m	m	B
43	Aq Cryofluvent	s	1	6785	2	71	60	6.6	15	A(6)l,AC(8)ls,C(48)ls-25	8	sp	r	m	n	B
56	Aq Cryofluvent	fr	2	6560	3	50	45	6.8	29	A(10)sl,AC(10)ls,C(13)ls-10,C(17)ls-75	7	sp	r	l	n	C
77	Te Borohemist	col	3	6860	3	2	0	6.4	0	O(46)H	30	vp		l	n	D
86	Aq Cryofluvent	ssk	2	6770	2	38	0	6.2	28	A(10)sl,AC(15)sl,C(21)ls-55	12	p	mr	m	n	C
95	Aq Cryofluvent	col	3	6890	1	66	30	6.6	13	A(5)l,AC(10)ls-15,IIA(15)l,IIC(36)s-25	8	vp	m	m	n	C
105	Aq Cryoboroll	s	2	6795	1	51	20	6.2	0	A(20)l,C(31)ls	13	sp	mr	m	n	C
110	Aq Cryoboroll	col	3	6340	1	51	15	6.1	0	A(15)l,AC(23)l,C(23)sl	15	sp	m	m	n	C
120	Hi Cryaquoll	col	8	6480	3	100	90	6.8	0	O(8)S,A(17)l,IIA(26)l,IIIO&C(10),IVO&C	19	sp	m	l	n	B
124	Aq Cryoboroll	s	3	6780	1	71	56	6.7	10	A(25)sl,AC(18)sl,C(13)s,C(15)s-45	8	sp	r	m	m	C
127	Ty Cryofluvent	s	0	6358	2	76	51	6.5	5	A(5)sl,A&C(37)ls,C(34)ls-10	7	sp	r	l	m	B
129	Ty Cryofluvent	s	2	6380	1	69	60	6.4	0	A(5)sl,C(5)s,A&C(64)s	10	sp	mr	l	m	C
131	Aq Cryofluvent	col	4	6570	3	51	25	6.2	0	A(20)l,C95)ls,IIA(11)l,IIC(15)sl	14	sp	m	m	n	C
174	Ty Cryaquent	fr	0	6090	1	10	0		85	O(15)L,C(25)s-85	3	vp	vr	l	m	D
SAGE/CACA																
7	Aq Cryofluvent	col	3	5940	2	60	52	7.8	0	A(7)sl,C(13)ls,IIO(6)H,IIC(34)sl	13	sp	mr	m	n	C
32	Mo Cryofluvent	l	3	6220	2	98	58		0	A(14)sl,C(17)s,C(5)sil,C(5)s,IIA(2),IIC	15	mw	ms	m	m	B
34	Aq Cryoboroll	l	1	6220	2	65	44	6.4	0	A(6)sil,IIA(17)l,IIC(11)ls,IIIA(4)sl	14	sp	s	l	n	C
41	Ty Cryoboroll	col	4	7575	2	160	140	6.6	12	A(18)l,A(16)sl,AC(33)sl,C(35)ls-35	10	mw	mr	m	n	A
52	Mo Cryofluvent	col	1	6300	1	78	60	6.5	4	A(32)l,IIAC(18)sl,IIC(10)ls,III.(8)sl-35	13	sp	mr	m	m	C
60	Ty Cryaquent	fl	2	6580	3	85	0		0	O(7)H,C(7)cl,C(21)ls	14	p	s	l	n	D
98	Ty Cryochrept	lsk	3	6620	3	110	100	6.2	13	A(10)l,B(18)sl,C(23)sl-10,C(29)sl-40	9	mw	mr	m	n	B
140	Cu Cryoboroll	l	1	6555	1	70	55	6.3	4	A(35)l,A(20)sil,C(13)l,C(12)ls-25	17	sp	m	m	m	C
161	Mo Cryofluvent	col	2	7370	2	140	110	6.6	t	A(28)l,AC(12)ls,IIIA(35)l,IIIB(30)l	15	mw	m	m	n	B

* Parameters and abbreviations are defined on final page of table.

Plot	Subgroup Taxa (Abbr) (1)*	Fam (2)	Sl % (3)	Elev (ft) (4)	Rel Pos (5)	gwl (cm) (6)	CF (cm) (7)	X pH (8)	X cf (9)	Abbreviated Pedon Description Horizon(Thickness)Texture-%Coarse Frag (10)	AWC % (11)	Dr cl (12)	Per cl (13)	IE cl (14)	Er cl (15)	HSG (16)
SAWO/CANI																
42	Aq Cryoboroll	ssk	5	7480	2	60	45	6.6	22	A(18)l,AC(17)ls-25,C(25)ls-55	9	sp	s	m	n	B
96	Aq Cryoboroll	col	3	6600	1	76	71	6.1	0	A(28)l,IIA(9)l,IIAC(14)ls,IIIA(20)sil	16	sp	m	m	n	B
115	Pa Cryoboroll	fl	4	6390	3	86	76	6.2	3	A(46)l,C(30)l-10	17	sp	m	m	n	C
125	Araq Cryoboroll	col	2	6590	1	87	56	6.5	0	A(26)l,B(8)sil,IIA(12)l,IIC(46)s	13	sp	m	m	n	C
DECE																
55	Aq Cryoboroll	l	2	6570	1	90	53	6.3	0	A(29)l,AC(11)ls,IIO(10)H,IIA(20)sil	17	sp	m	m	n	C
74	Ty Cryoboroll	col	1	6770	2	110	70		0	A(12)sil,A(17)sl,C(9)cl,IIA(32)sl,IIC	13	mw	ms	m	m	C
79	Ty Cryoboroll	col	0	7869	3	120	79	6.4	2	A(43)l,AC(36)l,C(21)sl-10	14	mw	m	m	n	B
82	Aq Cryoboroll	lsk	3	6820	2	81	66	6.3	8	A(25)l,AC(23)sl,IIA(18)scl-5	16	sp	ms	m	n	C
83	Aq Cryoboroll	lsk	3	6820	2	58	0	6.2	12	A(15)l,A(10)sil,IIA(13)cl,IIC(20)scl-35	16	sp	s	m	m	B
88	Aq Cryoboroll	ssk	2	6530	2	61	0	6.2	28	A(20)sil,C(13)scl-15,C(28)ls-55	11	sp	ms	m	n	C
92	Aq Cryoboroll	ssk	2	6915	2	81	61	6.3	18	A(18)sil,AC(14)sl-5,C(14)ls-15,C(20)ls-45	9	sp	mr	m	n	B
101	Aq Cryoboroll	col	1	6670	3	56	48	6.4	0	A(23)l,C(5)l,IIA(5)sil,IIC(15)ls	14	sp	m	m	n	C
113	Aq Cryoboroll	col	1	6380	2	76	70	6.6	0	A(28)sil,C(48)sl	14	sp	m	m	n	B
POPR																
10	Aq Cryofluvent	lsk	9	6600	2	55	27	7.8	24	A(13),C(42)sl-48	11	sp	m	m	n	C
16	Mo Cryofluvent	col	1	6230	2	110	100		15	A(14)sl,AC(11)l,IIO(6)H,IIC(9)sl	10	mw	m	m	n	B
31	Aq Cryoboroll	ssk	1	6220	2	55	40	6.8	29	A(28)l,IIC(12)ls-55,IIC(15)ls-40	11	sp	m	m	n	C
72	Mo Cryofluvent	lsk	1	7530	2	63	45	6.1	22	A(5)l,A(9)sil,C(22)l,C(24)sl-45,C(15)ls	12	sp	m	m	n	C
144	Ar Cryoboroll	col	4	7040	2	130	105	6.8	12	A(8)l,B(9)cl,,C(8)sl-10,C(75)sl-15	11	mw	ms	m	n	B
148	Araq Cryoboroll	col	0	7470	1	70	48	6.0	0	A(15)l,B(15)l,B(18)sl,IIA&C(7)sl	13	sp	m	m	n	C
153	Aq Cryoboroll	fr	3	7500	2	50	0	6.0	46	A(22)l,C(8)sl-75,C(20)sl-75	9	p	m	m	n	C
172	Aq Cryoboroll	col	2	6220	1	90	60	6.2	3	A(26)sl,C(14)ls,IIA(40)sil,IIC(10)sl-25	13	sp	m	m	n	B
SAMY/POPR																
1	Aq Cryofluvent	fl	3	5690	1	34	28	7.1	0	A(8)l,C(10)sl,IIA(16)sil	16	sp	ms	m	m	C
3	Ty Cryofluvent	fl	3	5840	1	105	95	6.5	11	O(6)L,A(14)sil,AC(25)sl,IIO(5)H,IIC(56)	17	mw	ms	m	m	C
11	Aq Cryofluvent	lsk	8	6600	2	40	35	7.8	38	A(10)sil,C(30)sl-50	10	sp	m	m	n	C
12	Aq Cryofluvent	lsk	7	6560	2	55	14	7.8	27	A(6)l,AC(8)l,C(36)scl,IIA(6)l,IIC(12)sl	12	sp	m	m	m	C
14	Ty Cryofluvent	col	2	6050	3	140	125	7.8	0	A(5),C(3)sl,IIO(4)H,IIC(28)sl,IIIC(60)s	10	mw	m	m	n	B
15	Mo Cryofluvent	s	3	6230	3	63	57	7.8	0	A(14)ls,AC(9)ls,C(20)s,IIO(8)H,IIC(18)sl	10	sp	mr	l	n	B
23	Aq Cryoboroll	lsk	2	6090	2	57	50	7.4	6	A(4)sl,C(5)ls,IIA(18)sl,IIAC(7)l,IIC(23)	9	sp	mr	m	n	C
24	Aq Cryofluvent	l	2	6090	2	46	38		0	A(7)l,C(5)sl,IIA(18)sil,IIC(10)sil	16	sp	ms	l	n	C
47	Ty Cryorthent	col	16	6220	2	120	110	6.8	0	A(6)sl,C(64)sl,C(30)ls	10	w	r	l	m	A
143	Aq Cryoboroll	col	3	7040	1	120	110	6.7	0	A(13)l,B(42)l,C(45)	14	mw	m	m	n	B

* Parameters and abbreviations are defined on final page of table

Plot	Subgroup Taxa (Abbr) (1)*	Fam (2)	Sl % (3)	Elev (ft) (4)	Rel Pos (5)	gwl (cm) (6)	CF (cm) (7)	X pH (8)	X cf (9)	Abbreviated Pedon Description Horizon(Thickness)Texture-%Coarse Frag (10)	AWC % (11)	Dr cl (12)	Per cl (13)	IE cl (14)	Er cl (15)	HSG (16)
ASIN- FEID																
39	Ty Cryoboroll	lsk	2	7500	2	125	115	6.6	34	A(25)l,AC(15)sl-15,C(60)sl-50	9	mw	mr	m	n	A
54	Aq Cryoboroll	l	2	6300	3	90	80	6.5	21	A(7)sl,A(19)l,B(27)l,C(10)sl,C(27)ls-70	17	mw	m	l	n	B
71	Araq Cryoboroll	col	3	7530	3	95	80	6.7	0	A(35)sicl,B(11)sicl,B(8)sl,,C(38)sl,C(5)	17	mw	s	h	n	C
80	Araq Cryoboroll	lsk	3	6820	1	74	38	6.5	24	A(28)l,B(10)scl,C(36)sl-50	11	sp	ms	m	n	C
116	Pa Cryoboroll	col	5	6380	3	91	63	6.5	3	A(36)l,A(27)sl,C(18)sl-5,C(16)sl-10	13	mw	mr	m	n	B
122	Araq Cryoboroll	s	3	6780	1	71	56	6.7	10	A(13)l,A(7)sil,B(13)l,C(41)sl,C(24)ls	14	mw	mr	m	n	A
SAEX																
6	Aq Cryofluvent	fr	3	5720	1	33	30	7.6	42	C(33)s-45	6	p	vr	l	vsv	D
13	Aq Cryofluvent	fr	3	6050	1	25	22	7.8	52	C(10)s-40,C(15)s-50	3	sp	vr	l	vsv	C
170	Ty Cryofluvent	fr	2	6460	2	75	60	6.6	80	C(60)s-80	3	sp	vr	l	sv	D
ALIN-COST																
4	Ty Cryorthent	col	1	5660	1	150	130	8.0	0	A(11)l,AC(15)sil,C(32)sil,C(42)sl	15	w	ms	m	n	B
5	Aq Cryofluvent	s	3	5670	1	43	40	7.8	0	A(9)sl,C(36)ls	9	sp	mr	l	n	B
17	Aq Cryofluvent	col	3	6230	1	85	60		0	O(12)H,AC(21)sl,C(52)sl	14	sp	mr	l	n	B
19	Aq Cryofluvent	s	3	6260	1	33	29		0	C(9)s,IIA(11)ls,IIC(9)ls,IIC(4)s	11	sp	r	l	n	C
22	Ty Cryofluvent	s	12	5980	1	98	90		2	A(5)l,C(5)sl,IIO(5)L,IIC(15)ls,IIIA(8)sl	10	sp	r	m	m	B
46	Dredged Entisol	fr		6220	2	120	110		95	C(100)sl-90	4	vex	vr	l	sv	A
48	Ty Cryofluvent	fr	35	6060	1	100	85	6.4	50	C(100)ls-50	4	vex	vr	l	sv	A
171	Ty Cryofluvent	fr	15	6360	1	180	160	6.6	40	O(8)L,C(100)ls-65	4	w	vr	l	n	A
175	Ty Cryofluvent	fr	5	5860	1	100	80	6.4	75	C(100)s-75	3	w	vr	l	sv	C
PUFR/DAIN																
36	Ty Cryoboroll	col	2	6130	3	110	100	6.8	7	A(20)sl,IIA(11)l,IIC(49)sl,IIC(20)ls-35	10	mw	m	l	m	B
45	Ty Cryochrept	fl	3	6320	3	110	80	7.2	0	A(9)l,B(19)l,B(15)sil,C(57)scl	18	mw	m	m	n	B
103	Ty Cryoboroll	col	2	6570	2	110	74	6.4	2	A(10)sl,A(20)l-10,AC(8)sl,C(36)sl	12	mw	mr	l	n	B
126	Ty Cryochrept	s	1	6360	2	160	150		4	A(10)sl,B(31)sl,B(16)l,C(24)ls,C(9)ls-25	11	w	mr	l	m	A
139	Aq Cryoboralf	ssk	2	6490	3	75	0	6.5	24	A(17)l,B(11)l,C(17)ls-30,C(40)ls-40	9	mw	mr	m	n	C
162	Mo Cryoboralf	fl	2	7310	3	120	90	6.2	0	A(10)l,B(18)cl,C(5)sl,C(67)l	17	mw	s	m	n	B
168	Ty Cryofluvent	s	4	7500	2	125	110		6	A(10)l,AC(30)l,C(10)l-20,C(15)ls-30	12	mw	m	m	n	B
169	Ty Cryoboroll	col	5	7600	1	140	130		15	A(8)sl,B(9)l,IIA(23)l,IIC(60)sl-25	13	mw	m	m	n	B
ARCA																
146	Mo Cryoboralf	col	3	6950	3	150	130	6.6	0	A(8)l,B(42)l,C(50)ls	14	w	m	m	n	A
158	Aq Cryoboroll	col	3	7380	3	115	98	6.3	4	A(10)sl,A(10)ls,C(12)ls-35,IIA(7)l,IIB(59)	14	mw	m	m	n	B

* Parameters and abbreviations are defined on final page of table.

APPENDIX F

SOIL INTERPRETATION CLASSES

Profile Permeability Class (Erickson, 1973)

1. Very slow (vs) - less than .15 cm/hour.
2. Slow (s) - greater than 0.15 but less than .51 cm/hour.
3. Moderately slow (ms) - greater than .51 but less than 1.5 cm/hour.
4. Moderate (m) - greater than 1.5 but less than 5.1 cm/hour.
5. Moderately rapid (mr) - greater than 5.1 but less than 15.8 cm/hour.
6. Rapid (r) - greater than 15.2 but less than 50.8 cm/hour.
7. Very rapid (vr) - greater than 50.8 cm/hour.

Hydrologic Soil Group (USDA-SCS, 1972)

A) (Low runoff potential.) Well to excessively well drained; soils with rapid infiltration and permeability rates.

B) (Moderately low runoff potential.) Moderately well to well drained; moderately slow to moderately rapid infiltration.

C) (Moderately high runoff potential.) Somewhat poorly drained with slow infiltration and permeability rates.

D) (High runoff potential.) Poorly and very poorly drained with slow infiltration and permeability rates.

Inherent Erodibility (Erickson, 1973) Quantified in terms of "K" value determined from textural triangle and modified for soil structure, OM content and rock fragment composition.

1. High - "K" is greater than 0.40.
2. Moderate - "K" greater than 0.20 but less than 0.40
3. Low - "K" less than 0.20

Drainage Class (USDA-SCS, 1979b)

1. Very poorly drained (vp). Ground water remains at or near the surface most of the time.

2. Poorly drained (p). Soil remains wet much of the time with the gwl seasonaly near the surface for prolonged intervals.

3. Somewhat poorly drained (sp). Soil is wet for significant periods, but not continually.

4. Moderately well drained (mw). Profile is wet for small but significant periods of time (gwl is at or below 100 cm).

5. Well drained (w). Water is removed from soil readily but not rapidly (gwl is well below 100 cm).

6. Somewhat excessively drained (sx). Water is removed rapidly. Soils are sandy and porous.

7. Excessively drained (ex). Water is removed very rapidly. Soils are fragmental or coarse-sands.

Available Water Holding Capacity (AWC) (USDA-SCS, 1979b)

1. Low (l) - less than 10% by volume.

2. Moderate (m) - greater than 10% but less than 20% by volume.

3. High (h) - greater than 20% by volume.

APPENDIX G

LIST OF RIPARIAN PLANT SPECIES

BETULACEAE
- Alnus incana
- Alnus sinuata
- Betula glandulosa

BORAGINACEAE
- Hackelia floribunda
- Mertensia campanulata
- Mertensia ciliata
- Plagiobothrys scouleri

CAPRIFOLIACEAE
- Lonicera caerulea
- Lonicera involucrata
- Sambucus sp.
- Symphoricarpos oreophilus

CARYOPHYLLACEAE
- Arenaria lateriflora
- Cerastium nutans
- Sagina sp.
- Silene menziesii
- Spergularia rubra
- Stellaria longipes

COMPOSITAE
- Achillea millefolium
- Agoseris glauca
- Antennaria anaphaloides
- Antennaria corymbosa
- Antennaria microphylla
- Arnica sp.
- Arnica amplexicaulis
- Arnica chamissonis
- Arnica cordifolia
- Arnica latifolia
- Arnica mollis
- Artemisia sp. (herbaceous)
- Artemisia cana ssp. viscidula
- Artemisia ludoviciana
- Artemisia tridentata ssp. vaseyana
- Aster campestris
- Aster eatonii
- Aster foliaceus
- Aster integrifolius
- Aster modestus
- Aster occidentalis
- Chrysothamnus nauseosus
- Cirsium sp.
- Erigeron coulteri

COMPOSITAE (cont'd)
- Erigeron lonchophyllus
- Erigeron peregrinus
- Gnaphalium palustre
- Haplopappus lanceolatus
- Haplopappus uniflorus
- Madia glomerata
- Saussurea americana
- Senecio cymbalarioides
- Senecio integerrimus
- Senecio pseudaureus
- Senecio serra
- Senecio sphaerocephalus
- Senecio triangularis
- Solidago canadensis
- Solidago multiradiata
- Taraxacum officinale
- Wyethia helianthoides

CORNACEAE
- Cornus stolonifera

CRUCIFERAE
- Arabis sp.
- Cardamine breweri
- Descurainea richardsonii
- Draba sp.
- Thlaspi fendleri

CUPRESSACEAE
- Juniperus communis

CYPERACEAE
- Carex sp. (vegetative)
- Carex aquatilis
- Carex athrostachya
- Carex atrata var. atrosquama
- Carex atrata var. erecta
- Carex aurea
- Carex buxbaumii
- Carex canescens
- Carex cusickii
- Carex dioica
- Carex disperma
- Carex geyeri
- Carex hoodii
- Carex jonesii
- Carex lanuginosa
- Carex lenticularis
- Carex leporinella

CYPERACEAE (cont'd)
- Carex livida
- Carex luzulina
- Carex microptera
- Carex muricata
- Carex neurophora
- Carex oederi
- Carex petasata
- Carex praegracilis
- Carex praticola
- Carex rostrata
- Carex saxatilis
- Carex scopulorum
- Carex simulata
- Eleocharis sp.
- Eleocharis pauciflora
- Scirpus cespitosus

DROSERACEAE
- Drosera anglica

ELAEAGNACEAE
- Shepherdia canadensis

EQUISETACEAE
- Equisetum arvense
- Equisetum hyemale
- Equisetum laevigatum

ERICACEAE
- Arctostaphylos uva-ursi
- Cassiope mertensiana
- Gaultheria humifusa
- Kalmia microphylla
- Ledum glandulosum
- Menziesia ferruginea
- Phyllodoce empetriformis
- Pyrola asarifolia
- Pyrola minor
- Pyrola secunda
- Pyrola uniflora
- Vaccinium caespitosum
- Vaccinium occidentale
- Vaccinium scoparium

FUMARIACEAE
- Corydalis aurea
- Corydalis caseana var. cusickii

GENTIANACEAE
- Gentiana affinis
- Gentiana amarella
- Gentiana calycosa
- Gentiana simplex
- Swertia perennis

GRAMINEAE
- Agropyron caninum ssp. majus var.majus
- Agrostis sp.
- Agrostis alba
- Agrostis diegoensis
- Agrostis exarata
- Agrostis humilis
- Agrostis idahoensis
- Agrostis scabra
- Agrostis thurberiana
- Alopecurus aequalis
- Alopecurus pratensis
- Bromus carinatus
- Bromus ciliatus
- Calamagrostis canadensis
- Calamagrostis rubescens
- Catabrosa aquatica
- Danthonia intermedia
- Deschampsia cespitosa
- Deschampsia elongata
- Elymus glaucus
- Festuca idahoensis
- Festuca rubra
- Glyceria elata
- Glyceria striata
- Hierochloe odorata
- Hordeum brachyantherum
- Koeleria cristata
- Melica spectabilis
- Muhlenbergia andina
- Muhlenbergia filiformis
- Muhlenbergia richardsonis
- Phalaris arundinacea
- Phleum alpinum
- Phleum pratense
- Poa leptocoma
- Poa nevadensis
- Poa palustris
- Poa pratensis
- Puccinellia pauciflora
- Sitanion hystrix
- Stipa occidentalis var. minor
- Trisetum spicatum
- Trisetum wolfii

GROSSULARIACEAE
- Ribes hudsonianum
- Ribes lacustre

HYDROPHYLLACEAE
- Nemophila breviflora
- Phacelia sp.
- Phacelia hastata var. alpina

HYPERICACEAE
- Hypericum anagalloides
- Hypericum formosum

IRIDACEAE
- Sisyrinchium angustifolium

JUNCACEAE
- Juncus sp.
- Juncus balticus
- Juncus ensifolius
- Juncus filiformis
- Juncus longistylis
- Juncus nevadensis
- Juncus regellii
- Luzula campestris
- Luzula parviflora

JUNCAGINACEAE
- Triglochin sp.

LABIATAE
- Agastache urticifolia
- Mentha arvensis

LEGUMINOSAE
- Astragalus alpinus
- Astragalus robinsii
- Lupinus lepidus var. utahensis
- Lupinus polyphyllus
- Oxytropis deflexa
- Trifolium longipes
- Trifolium pratense
- Trifolium repens

LENTIBULARIACEAE
- Utricularia minor

LILIACEAE
- Calochortus sp.
- Camassia quamash

LILIACEAE (cont'd)
- Smilacina stellata
- Streptopus amplexifolius
- Tofieldia glutinosa
- Zigadenus elegans

ONAGRACEAE
- Epilobium sp.
- Epilobium angustifolium
- Epilobium glandulosum
- Gayophytum decipiens
- Oenothera sp.

OPHIOGLOSSACEAE
- Botrychium lunaria

ORCHIDACEAE
- Corallorhiza trifida
- Habenaria dilatata
- Habenaria obtusata
- Habenaria saccata
- Listera borealis
- Spiranthes romanzoffiana

PINACEAE
- Abies lasiocarpa
- Picea engelmannii
- Pinus contorta
- Pseudotsuga menziesii

PLANTAGINACEAE
- Plantago sp.

POLEMONIACEAE
- Collomia linearis
- Linanthus harknessii
- Microsteris gracilis var. humilior
- Phlox sp.
- Polemonium occidentale

POLYGONACEAE
- Eriogonum umbellatum
- Polygonum bistortoides
- Polygonum douglasii
- Polygonum viviparum
- Rumex sp.

PORTULACACEAE
- Montia cordifolia

POTAMOGETONACEAE
- Potamogeton sp.

PRIMULACEAE
- Androsace sp.
- Dodecatheon jeffreyi
- Dodecatheon pulchellum

RANUNCULACEAE
- Aconitum columbianum
- Actaea rubra
- Aquilegia flavescens
- Caltha biflora
- Caltha leptosepala
- Delphinium sp.
- Ranunculus sp.
- Ranunculus acriformis
- Ranunculus alismaefolius
- Ranunculus inamoenus
- Thalictrum alpinum
- Thalictrum occidentale
- Trollius laxus

RHAMNACEAE
- Rhamnus alnifolia

ROSACEAE
- Amelanchier alnifolia
- Fragaria virginiana
- Geum macrophyllum
- Geum triflorum
- Horkelia fusca
- Potentilla diversifolia
- Potentilla flabellifolia
- Potentilla fruticosa
- Potentilla glandulosa
- Potentilla gracilis
- Rosa woodsii
- Rubus idaeus
- Rubus parviflorus
- Sanguisorba sitchensis
- Sorbus scopulina
- Spiraea densiflora
- Spiraea douglasii

RUBIACEAE
- Galium boreale
- Galium trifidum
- Galium triflorum

SALICACEAE
- Populus tremuloides
- Populus trichocarpa

SALICACEAE (cont'd)
- Salix brachycarpa
- Salix commutata
- Salix drummondiana
- Salix exigua ssp. exigua
- Salix exigua ssp. melanopsis
- Salix geyeriana
- Salix lasiandra
- Salix monticola
- Salix myrtillifolia
- Salix phylicifolia
- Salix rigida var. mackenziana
- Salix scouleriana
- Salix wolfii var. idahoensis

SAXIFRAGACEAE
- Mitella pentandra
- Parnassia fimbriata
- Saxifraga arguta
- Saxifraga oregana

SCROPHULARIACEAE
- Castilleja cusickii
- Castilleja gracillima
- Castilleja miniata
- Castilleja sulphurea
- Collinsia parviflora
- Mimulus guttatus
- Mimulus lewisii
- Mimulus primuloides
- Pedicularis bracteosa
- Pedicularis groenlandica
- Penstemon attenuatus
- Penstemon globosus
- Penstemon procerus
- Verbascum thapsus
- Veronica americana
- Veronica peregrina
- Veronica scutellata
- Veronica serpyllifolia
- Veronica wormskjoldii

SELAGINALLACEAE
- Selaginella selaginoides

UMBELLIFERAE
- Angelica arguta
- Ligusticum canbyi
- Ligusticum tenuifolium
- Osmorhiza chilensis
- Sphenosciadium capitellatum
- Zizia aptera

URTICACEAE
Urtica dioica

VALERIANACEAE
Valeriana edulis
Valeriana sitchensis

VIOLACEAE
Viola sp.
Viola adunca
Viola macloskeyi
Viola nephrophylla

APPENDIX H

STREAM ABBREVIATION CODES

(B) = Boise NF (C) = Challis NF (S) = Sawtooth NRA

AS - Asher Creek (C)

AY - Ayers Creek (B)

BAN - Banner Creek (C)

BA - Basin Creek (C)

BR - Bear Creek (C)

BVL - Bear Valley Creek (B)

BVR - Beaver Creek (C)

BEN - Bench Creek (C)

BS - Blind Summit area (C,S)

CPH - Cape Horn Creek (C)

DA - Dagger Creek (B)

EL - Elk Creek (B)

FIR - Fir Creek (B)

FI - Fisher Creek (S)

FK - Fishhook Creek (S)

4J - Fourth of July Creek (S)

FR - Frenchman Creek (S)

HD - Headwaters Creek (S) (Salmon River)

HL - Hellroaring Creek (S)

HO - Holman Creek (S)

HU - Huckleberry Creek (S)

KN - Knapp Creek (C)

LC - Last Chance Creek (S)

MR - Marsh Creek (C)

MA - Mays Creek (S)

MCK - McKay Creek (C)

MF - Middle Fork Salmon R. (B,C)

PA - Park Creek (S)

PG - Pigtail Creek (S)

PO - Pole Creek (S)

PCM - Pole Creek Meadow (S)

RF - Redfish Lake Creek (S)

SA - Salmon River (S,C)

SL - Slate Creek (S)

ST - Stanley Creek (S)

STL - Stanley Lake Creek (S)

VL - Valley Creek (C,S)

VAN - Vanity Summit area (C)

WS - Warm Springs Creek (S)

YF - Yankee Fork River (C)